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THORNBERRY (H. H.). **Particle size of three strains of Tobacco-mosaic virus.**—Abs. in *Phytopathology*, xxv, 1, p. 36, 1935.

The particle size of the related tobacco, aucuba, and masked tobacco mosaic viruses was determined by ultrafiltration through Elford's type of collodion membranes [*R.A.M.*, xii, p. 646]. In finding the end point of ultrafiltration (the smallest pores admitting passage of the virus), the amount of virus in the filtrates was measured by the local lesion method [ibid., xiv, p. 198] on Scotia beans [*Phaseolus vulgaris*]. Under favourable conditions for filtration (0·1 M. Sörensen's phosphate buffer at P_H 8·5 and 10 per cent. broth), membranes with pores 0·0905 μ in diameter allowed the passage of a small quantity of each virus. Membranes with pores 0·0329 μ in diameter retained the viruses. Elford assumes that virus particles exceeding one-third of the pore diameter do not pass the membranes, and on this basis the virus particles were found to measure not more than 0·05 μ or 30 $\mu\mu$.

VALLEAU (W. D.). **The resistance of Ambalema Tobacco to different viruses.**—Abs. in *Phytopathology*, xxv, 1, p. 37, 1935.

Nicotiana tabacum var. Ambalema, found by Nolla to be highly resistant to ordinary tobacco mosaic, is susceptible to cucumber mosaic, green and yellow ring spot, and slightly resistant to the etch viruses [*R.A.M.*, xii, p. 205]. Most of the twenty-seven strains of tobacco mosaic inoculated into Ambalema plants caused only very mild symptoms, but four produced chlorotic (in one virus necrotic) Liesegang patterns, often covering the leaf and evidently resulting from slow penetration of healthy tissues. Ambalema appears to separate strains from a given supposedly stable tobacco mosaic virus by a process analogous to that involved in the production of so-called attenuated strains by heat. A strain of white tobacco mosaic from Kentucky and the English aucuba mosaic each produced necrotic spots and concentric necrotic ring patterns on inoculated Ambalema leaves, the virus apparently being localized.

DUGGAR (B. M.) & MCALISTER (D. F.). **Some factors affecting 'longevity' in vitro of viruses of Tobacco mosaic and of Tobacco ring spot.**—Abs. in *Phytopathology*, xxv, 1, p. 15, 1935.

The length of survival of the typical tobacco mosaic virus in tobacco extract is prolonged by condensation of the extract at low pressure and

temperature, and further by the addition of low concentrations of ethyl alcohol. The active period of the tobacco ring spot virus (Wingard strain) may also be prolonged, within limits, by a low concentration of alcohol and by the addition of certain buffers, preferably phosphate, at definite P_H values, especially between P_H 5·8 and 7. The phosphate buffer also increases the dispersion of the ring spot virus as gauged by the incidence of primary infection lesions.

VALLEAU (W. D.). **Do Tobacco plants recover and develop an immunity from ring spot?**—Abs. in *Phytopathology*, xxv, 1, p. 37, 1935.

The apparent recovery and immunity of tobacco plants from ring spot [see preceding abstracts] may be explained as follows. Plants inoculated with the virus develop ring patterns on the leaves until invasion of the growing point is complete. The foliage developing after complete invasion is devoid of patterns, but is nevertheless highly viruliferous. The inoculation of such leaves is without effect, the cells being already parasitized to the limit. An acquired immunity [*R.A.M.*, xii, p. 120] is not involved. Similarly, tobacco plants inoculated with a mild strain of tobacco mosaic are protected against a more virulent strain of the same virus [cf. ibid., xiv, pp. 330, 388].

MATSUMOTO (T.) & SOMAZAWA (K.). **Immunological studies of mosaic diseases. IV. Effects of acetone, lead subacetate, barium hydroxide, aluminium hydroxide, trypsin and soils on the antigenic property of Tobacco mosaic juice.**—*J. Soc. trop. Agric. Taiwan*, vi, pp. 671–682, 1934.

A detailed, tabulated account is given of the writers' further studies on the antigenic properties of tobacco mosaic juice [*R.A.M.*, xii, p. 598], involving in the first place serological tests on the partially purified virus [cf. ibid., xiii, p. 545], which was freed from accretions by the addition of appropriate amounts of acetone, lead acetate, and barium or aluminium hydroxide. The results of these experiments showed that antigenic properties of mosaic juice persisted for the duration of infectivity. Mary Lojkin and Vinson have shown [ibid., xi, p. 334] that trypsin can inactivate the infectivity of the virus [cf. ibid., xiv, p. 199] only when the latter is treated with acetone previously to contact with the enzyme. The antigenic property, however, remains unimpaired in both the acetone-treated and control juices. Passage through soil, especially in the case of sterilized or dry material, greatly reduced the antigenic capacity and infectivity of the virus.

From a consideration of these results it may be inferred that the above-mentioned serological reactions are due, not to modifications in the plant proteins and the like, but to the antigenic property of the virus *per se*. Some evidence, not yet entirely conclusive, was obtained in support of the view that the virus is absorbed by the roots of plants grown in nutrient solutions without necessarily producing any external symptoms except under favourable conditions.

ROSS (A. F.). **The effect of proteoclastic enzymes on purified preparations of Tobacco mosaic virus.**—Abs. in *Phytopathology*, xxv, 1, p. 33, 1935.

The tobacco mosaic virus was inactivated by trypsin [see preceding

abstract], but most of the virus was recovered on heating the digests to 70° C. for 20 minutes. Permanent inactivation of the virus did not follow the use of enterokinase, calcium sulphate, calcium chloride, ammonium sulphate, magnesium sulphate, and barium chloride as activators for trypsin. A combination of trypsin and pepsin [*R.A.M.*, xiv, p. 260] had less inactivating effect than the former alone. The virus was inactivated by papain and (slowly) by mixed cultures of *B*[*acillus*] *proteus* and *B. aerogenes*. Trypsin did not appear to attack any protein that may be associated with the virus.

CLAYTON (E. E.). **A new and important factor in the epidemiology of Tobacco leaf diseases.**—Abs. in *Phytopathology*, xxv, 1, p. 11, 1935.

Recent observations indicate that the well-known promotion of tobacco wildfire (*B*[*acterium*] *tabacum*) epidemics by storms is largely a result of a breakdown in the resistance of the host, the intercellular leaf spaces of which, flooded by the driving rains, develop well-defined water-soaked areas, through which the bacteria rapidly spread, forming within 48 hours necrotic lesions of considerable extent. Similarly, *B*[*act.*] *angulatum* rarely forms spots exceeding $\frac{1}{8}$ in. in diameter on the normal leaf, whereas in water-soaked tissues the large lesions typical of field black fire readily develop. Low topping and low potash or high nitrogen manuring increase the liability of the foliage to water-soaking and hence to these diseases, the reverse effects following high topping and high potash or low nitrogen fertilizing.

HENDERSON (R. G.). **Control of downy mildew of Tobacco.**—Abs. in *Phytopathology*, xxv, 1, p. 19, 1935.

Effective control of tobacco downy mildew [*Peronospora* sp.: *R.A.M.*, xiii, p. 604] was given in greenhouse tests by benzoic acid, cuprous oxide [ibid., xiv, p. 382], and copper-molasses mixture sprays. Good results were also obtained in these and previous trials with calcium sulphide [ibid., xiii, p. 402], applied at three-day intervals; the stunting that characterized the treated greenhouse plants was not apparent in the open.

BORDELEAU (R.). **The black rot of Tobacco in the Province of Quebec.**—*Rep. Quebec Soc. Prot. Pl. 1932–1934*, pp. 135–139, 1934.

After stating that in both of the large tobacco-growing areas in Quebec black root rot (*Thielavia* [*Thielaviopsis*] *basicola*) [*R.A.M.*, xiii, pp. 13, 276] is very prevalent, causing up to 75 per cent. losses, especially in poorly drained or alkaline soils, the author gives brief recommendations for preventive treatment by seed-bed disinfection either with steam or by applications of 1 in 50 formalin (40 per cent. formaldehyde) made at the rate of half a gallon per sq. ft., and improved cultural methods. As the soil locally tends to be acid and soil acidity is known to be unfavourable to the disease [ibid., xii, p. 493], care must be taken in the use of lime.

In varietal resistance tests the pipe varieties S. S. Burley, Waine, Greenwood, and Belge proved very susceptible. Infection reduced the yield of the most suceptible cigar varieties, such as Brown's Havana and Connecticut Havana 38, by 50 per cent., though with the more

resistant varieties of this type the quality was more adversely affected than the yield. With the susceptible varieties the quality was reduced by at least one-third. Fifty-seven per cent. of the roots of Resistant Havana and 40 per cent. of those of Connecticut Havana 142 C3 X were unaffected, and no root of either of these two varieties was severely attacked. With susceptible cigar varieties 10 to 35 per cent. of the plants were severely infected, at least half the roots showing moderate attack.

BÖNING (K.). **Beiträge zur physiologischen Pathologie des Tabaks.** [Contributions to the physiological pathology of Tobacco.]—*Prakt. Bl. Pflanzenb.*, xii, 10, pp. 303–311, 3 figs., 1935.

Tobacco in acid soils in the district between Nuremberg and Erlangen, Germany, is stated to be liable to chlorosis, thickening, and spotting of the foliage which was found to be due to the presence in the soil of insoluble manganese salts [*R.A.M.*, xi, p. 548] in the proportion of 80 to 270 mg. per kg. The condition, which also affected barley, wheat, beets, cabbage, and swedes, as well as various weeds, was ameliorated by the application to the soil in appropriate amounts of the carbonates of lime, magnesium, or sodium, or of calcium sulphate or chloride. The beneficial effect of the treatment was apparently due, not only to the adjustment of the soil reaction but also to the counteraction by the calcium ion, either of the absorption of the manganese ion or of the injurious influence of the latter after absorption.

SHAPOVALOV (M.). **Chemical splitting of the Tomato 'combination-streak' virus complex.**—Abs. in *Phytopathology*, xxv, 1, p. 33, 1935.

Of the two virus components of the 'combination-streak' of tomato [*R.A.M.*, xiv, p. 201], green tobacco mosaic (Johnson's virus No. 1) generally showed a higher resistance to chemicals than the latent (healthy) potato virus. Certain sulphates, viz., cobaltic, nickel and zinc, at concentrations incapable of destroying the entire complex sometimes inactivated one or other of the two components in the expressed juice completely, leaving the second to survive alone.

GARDNER (M. W.), TOMKINS (C. M.), & WHIPPLE (O. C.). **Spotted wilt of truck crops and ornamental plants.**—Abs. in *Phytopathology*, xxv, 1, p. 17, 1935.

Additional hosts of the tomato spotted wilt virus in California [*R.A.M.*, xiv, p. 201] have been experimentally shown to include cauliflower, celery, *Nicotiana glauca*, and species of *Amaryllis*, *Begonia*, *Browallia*, *Campanula*, *Cheiranthus*, *Delphinium*, *Gloxinia*, *Godetia*, *Gaillardia*, *Layia*, *Papaver* [cf. ibid., xiv, p. 129], *Pentstemon*, *Primula*, *Salvia*, and *Verbena*. The virus has been transmitted by *Thrips tabaci* from *Emilia* to *Emilia* and tomato, and by *Frankliniella* spp. from *Datura* to poppy and from tomato to tobacco. It has been found to survive 73 hours' storage at 0°. Spotted wilt appears to be favoured by fairly low temperatures and a moist climate.

BOYD (O. C.). **Evidence of the seed-borne nature of late blight (Phytophthora infestans) of Tomatoes.**—Abs. in *Phytopathology*, xxv, 1, p. 7, 1935.

Until the outbreaks of 1932 and 1933, late blight (*Phytophthora*

infestans) had caused no damage to tomatoes in Massachusetts since 1905 [*R.A.M.*, xii, p. 249; see also xiii, p. 52]. An experiment at Amherst in 1934 showed that the fungus overwintered in tomato seed saved in 1933 and so initiated infection in the next season's crop, and seed from affected plants in that and the following year contained mycelium outside and within the seed coats which gave pure cultures of *P. infestans* on agar. The 1932 and 1933 late blight epidemics may possibly be due in part to the favourable conditions for the survival of the fungus in the seed provided by the two preceding exceptionally mild winters.

Baldacci (E.) & Ciferri (R.). **Intorno alla patogenicità di alcuni batterii dell'uomo per il frutto del Pomodoro.** [Concerning the pathogenicity of some human bacteria to Tomato fruit.]—*Boll. Soc. ital. Biol. sper.*, ix, 3, pp. 197–200, 1934.

Only two out of the twenty-three bacterial pathogens of man inoculated under controlled conditions into the fruit of San Marzano tomatoes gave positive results in the form of an ordinary rot indistinguishable from that induced by various plant pathogens [cf. *R.A.M.*, vi, p. 263]; these were *Proteus vulgaris* and [*Bacillus*] *pyocyaneus* [ibid., xiv, p. 16]. Similar results were obtained with two non-pathogenic, chromogenic (orange and pink) cocci, but in no case did the organisms cause the typical symptoms of 'apical rot' a disease which, though commonly attributed to *Bacterium briosii* [ibid., vii, pp. 9, 491], the authors consider to be of physiological origin.

Ciferri (R.) & Baldacci (E.). **Intorno alla patogenicità di alcuni miceti dell'uomo per il frutto del Pomodoro.** [Concerning the pathogenicity of some human fungi to Tomato fruit.]—*Boll. Soc. ital. Biol. sper.*, ix, 3, pp. 200–202, 1934.

Of 22 human pathogenic fungi and 1 insectivorous fungus inoculated under controlled conditions into tomato fruits [cf. preceding abstract], 18 gave positive results, viz., *Coccidioides immitis* [*R.A.M.*, xiv, p. 234], *Lichtheimia italica* [ibid., vii, p. 720], *Mucor racemosus* [ibid., xiv, p. 236], *Debaryomyces fabryi* Ota, *Hansenula anomala* (Hans.) Syd., *Geotrichum candidum* Link [ibid., ix, p. 201] var. *parasiticum* Pr. et P., *Fusarium moronei* Curzi [ibid., x, p. 540], *Torula sacchari* [ibid., xiii, p. 701], *Acrostalagmus cinnabarinus* [ibid., xiv, p. 237], *Beauveria bassiana* [ibid., xiv, p. 361], *Cephalosporium acremonium* [ibid., xiii, p. 572], *C. gruetzii* [cf. ibid., viii, p. 783], *C. cerebriforme*, *Microsporon audouini* [ibid., xiii, p. 768; xiv, p. 102], *Penicillium brevicaule* [*Scopulariopsis brevicaulis*: ibid., xiv, p. 104], *Sporotrichum councilmani* [ibid., xi, p. 647], *S. gougeroti* [ibid., xii, p. 579], *Trichophyton roseum* [ibid., xii, p. 173], and *Trichosporum aschii* Ota.

These results are considered not only to confirm those obtained by Rhoda Benham and Beatrice Keston with various species of *Sporotrichum* in the United States [ibid., xi, p. 646], but also to amplify their conclusions as regards the adaptability of human pathogens to plant hosts.

May (C.). **Notes on the work of the Dutch Elm disease laboratory.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf., 1934*, pp. 73–75, 1 graph, [? 1934.]

Between 26th June, 1934, when the Dutch elm disease [*Ceratostomella ulmi*: *R.A.M.*, xiv, p. 338] research laboratory of the Division of Forest Pathology, Bureau of Plant Industry, was opened at Morristown, New Jersey, and the following 18th August, 8,763 specimens of diseased elm material, mostly from New Jersey, New York, and Connecticut, were received and cultured. Among the disorders liable to confusion with the Dutch elm disease are the wilts due to *Verticillium* [*albo-atrum*: ibid., xii, p. 125] and a *Cephalosporium* [ibid., xiii, p. 478], the pycnidial stage of which is stated to have been recently detected. The graph showing the incidence of the different diseases indicates that the *Cephalosporium* wilt appears somewhat earlier in the season than Dutch elm disease, the maximum incidence of which (just over 80 per cent.) was recorded during the period from 11th to 20th June and again, with only a negligible drop, from 1st to 10th July.

Beattie (R. K.). **Advances in our knowledge of the Dutch Elm disease.**—*Proc. nat.* [*U.S.*] *Shade Tree Conf., 1934*, pp. 76–78, [?1934.]

Most of the information in this brief account of recent progress in the knowledge of the Dutch elm disease [*Ceratostomella ulmi*: see preceding abstract] has already been noticed from other sources, but the following points are of interest. Burl elm logs, imported into the United States for the cutting of fancy veneer, have been intercepted and found to harbour the fungus at New York, Baltimore, Norfolk, and New Orleans; at Baltimore an infected tree was observed within a quarter of a mile of the unloading pier. On the defoliation of elm trees about mid-October, external symptoms of infection disappear, but a method of twig sampling was evolved during the winter of 1933–4 to facilitate the detection of diseased individuals in regions known to be invaded by *C. ulmi*. Coremia of the *Graphium* stage of the fungus, hitherto obtained only in laboratory cultures, have been found in the bark of a standing tree dead for about a year. Special attention is being given to the work of propaganda in camps of the Civilian Conservation Corps.

The paper was followed by a discussion (pp. 78–95), in which the author was represented by C. May.

Köck (G.). **Eichenmehltau und Rauchgasschäden.** [Oak mildew and smoke gas injuries.]—*Z. PflKrankh.*, xlv, 1, pp. 44–45, 1935.

During his eight years' activity as a smoke injury expert in Upper Styria, Austria, the writer was impressed by the complete absence of the otherwise widespread oak mildew (*Microsphaera alni* var. *quercina*) [*M. quercina*: *R.A.M.*, xiv, p. 190] from the vicinity of factories. Evidently the sulphurous acid-containing gases emanating from paper works and the like exert a fungicidal action on the mildew similar to that of the sulphur dusts commonly used for its control.

ASHCROFT (J. M.). **European canker of Black Walnut and other trees.**—*Bull. W. Va. agric. Exp. Sta.* 261, 52 pp., 7 pl., 1934. [Received March, 1935.]

This is a detailed, tabulated account of the author's studies of the canker on black walnut (*Juglans nigra*) in West Virginia associated with *Nectria* [*R.A.M.*, ix, p. 751]. Two main types of the younger stages of the disease are distinguished, namely, one usually developing around a stub of a lateral branch, in which the bark at first remains adherent to the wood and is only later sloughed off from the centre, and the other, apparently not associated with a dead stump, first appearing as a tumour-like swelling on the trunk which, after reaching a considerable size, bursts open and exposes the underlying wood. Both types develop in the same way in their later stages. Similar cankers were also found in West Virginia on *Liriodendron tulipifera*, *Acer rubrum*, *Quercus rubra*, *Q. velutina*, *Q. alba*, *Hicoria glabra*, and *Juglans cinerea*. The black walnut cankers have been found in eight other States to the north-east and in Ontario, Canada.

The histological examination of one-year-old cankers resulting from inoculations into young black walnut trees indicated that the fungus kills the invaded tissues in advance of its growth, as the mycelium has never been observed inside of, or contiguous to living cells. At first growth in the bark tissues appears to be mostly, if not entirely, intercellular; staining tests suggested that the hyphae advance between the cells by dissolving the pectic compounds of the middle lamella and cell wall; the invasion progresses very much more rapidly in the phloem than in the cortex. The wood is apparently reached through the medullary rays, and is much less actively destroyed than the bark, the mycelium remaining entirely intracellular in the xylem. Micro-chemical tests showed that the fungus does not attack either lignin or cellulose. Soon after the resumption of cambial activity in the spring, the host reacts by the formation of phellogen extending from the cambium outward; the cambial activity is most vigorous at the margins of infection, the amount of tissue produced in these regions far exceeding that on the opposite side of the stem. The cells first produced at the edge of the canker do not develop into normal xylem but remain undifferentiated, and go to form a mass of tissue which bulges out in the direction of the wound. Inoculation experiments indicated that the fungus enters the host tissues only through wounds reaching down to the cambium, and fully developed cankers were produced on black walnut in this manner.

In a full discussion of the taxonomy of the species of *Nectria* which cause cankers on deciduous trees [which are listed in two tables] and of closely related species, the author shows that the size of the spores is of no systematic value; he describes, however, certain morphological characters, on the basis of which he separated the species studied by him into three groups, the first of which includes all the specimens associated with cankers of the hosts mentioned in the first paragraph, together with the type specimen of *N. galligena*. Cross-inoculations showed that the forms from each of these hosts can infect the black walnut, while that from the latter can infect black and white oak, white walnut (*J. cinerea*), and four species of *Hicoria*. It is concluded that all

the cankers studied are caused by the 'European canker' fungus, *N. galligena*.

HAMOND (JOYCE B.). **A graft disease of Walnuts caused by a species of Chalaropsis.**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 158–159, 1935.

In this brief note the author states that the strain of *Chalaropsis thielavioides* isolated from diseased walnut grafts at the East Malling Research Station [*R.A.M.*, xi, p. 80] was compared with three strains of the fungus from a walnut root, carrots [ibid., xi, p. 423], and peach seedlings, respectively. While all the four strains bore a general morphological resemblance, that from carrots differed in its almost spherical macrospores of an olive-green colour in mass. In their cultural relations they tended to form a series from the walnut graft to the carrot strain, and their response to temperature suggested an adaptation of the fungus to the environment of its host. Naturally infected walnut roots showed varying degrees of disintegration of the tissue, beginning at the surface of wounds, and histological studies indicated that *C. thielavioides* always enters young walnut trees through a wound or at a cut surface, not through the uninjured bark. When inoculated into walnuts at the time of grafting, the four strains differed strikingly in degrees of parasitism, though none did much damage when inoculated into shoots of established trees.

Laboratory tests showed that the macrospores of the fungus are very easily killed by formalin, and this is now generally used at East Malling to control the walnut graft disease. Macrospores similar to those observed on walnut grafts have been identified on some walnut shells in the Kew Herbarium.

CHARLES (VERA K.). **A little known Pecan fungus.**—*Mycologia*, xxvii, pp. 74–82, 2 figs., 1935.

The writer describes and discusses the morphological characters of a fungus of somewhat obscure affinity appearing in the form of snow-white tufts on the lower surface of living pecan (*Hicoria* [*Carya*] *illinoensis*) leaves in Texas, in relation chiefly to its taxonomic position. From a study of the available exsiccata and the relevant literature it is concluded that the organism is a new variety (var. *minor*) of *Articularia quercina* (Peck) von Höhnel, the host of which is oak. It is characterized by 12- to 16-jointed conidiophores closely united into an erect bundle, 0·5 mm. in height, each conidiophore bearing eight oblong to fusoid, slightly curved, hyaline conidia, 6 to 8 by 2·5 to 3 μ in diameter.

Articulariella aurantiaca (Ell. & Mart.) v. Höh. is considered in the light of these investigations to be synonymous with *Fusisporium album* Desm., *Helostroma album* (Desm.) Pat., and *Microstroma album* (Desm.) Sacc. [*R.A.M.*, xi, p. 745].

JACKSON (L. W. R.) & SLEETH (B.). **A new disease affecting Platanus orientalis in the eastern United States.**—Abs. in *Phytopathology*, xxv, 1, p. 22, 1935.

A destructive disease associated with an *Endoconidiophora* form of *Ceratostomella* [cf. *R.A.M.*, xiv, pp. 270, 274] is stated to be destroying oriental planes (*Platanus orientalis*) at an alarming rate in Delaware

County, Pennsylvania. The foliage of affected trees becomes progressively sparser and suddenly wilts, while the bark on the main trunk shows numerous longitudinal lesions corresponding to black wood discolorations sometimes extending inwards to the pith. Positive results resembling the spontaneous infections followed inoculation of 14 two-year-old plane cuttings with pure cultures of the fungus (which emits a strong banana-oil odour), the incubation period ranging from 4 to 13 weeks. Bark lesions ½ in. long were produced in 11 days by inoculation on uninjured sites.

HARTLEY (C.) & CRANDALL (B. S.). **Vascular disease in Poplar and Willow.**—Abs. in *Phytopathology*, xxv, 1, pp. 18–19, 1935.

The wood of Lombardy poplars (*Populus nigra*) in the District of Columbia is stated commonly to show water-soaked, later red, and ultimately brown stains, from the marginal region of which short, rod-shaped bacteria, forming quantities of gas, are readily isolated. Death does not ensue until the infection has spread almost throughout the cross section of the trunk. A similar disorder has been observed in cottonwood (*P. deltoides*), goat willow (*Salix capraea*), and other as yet unidentified willows. In both poplar and willow the symptoms are somewhat suggestive of the 'watermark' disease of the latter host in Europe [*Pseudomonas saliciperda*: *R.A.M.*, xiii, p. 334]. Reddish discolorations containing bacteria also occur in many young plane trees (*Platanus* sp.) in a nursery near Washington.

POMERLEAU (R.). **The fungi responsible for seedling blight of Conifers at the Berthierville forest nursery.**—*Rep. Quebec Soc. Prot. Pl., 1932–1934*, pp. 58–61, 1934.

Observations on the fungi responsible for the considerable annual mortality due to blight among conifer seedlings at the forest nursery, Berthierville, Quebec, showed that out of 165 cultures from affected material 22 yielded *Alternaria* sp., 16 were *Fusarium solani*, 8 *F. ferruginosum*, 7 *F. redolens* var. *solani* and 7 *F. subpallidum*, some 12 other species of this genus being occasionally found; *Rhizoctonia* was sometimes isolated, but *Pythium de Baryanum* was not encountered. The most virulent of the organisms appeared to be *Rhizoctonia* sp., which was chiefly responsible for the rotting of the rootlets.

JACKSON (L. W. R.) & CRANDALL (B. S.). **A Phytophthora root and collar rot of Pinus resinosa seedlings.**—Abs. in *Phytopathology*, xxv, 1, p. 22, 1935.

Severe damage has been inflicted of recent years on *Pinus resinosa* seedling and transplant stock in an eastern United States forest nursery by a species of *Phytophthora* closely resembling *P. cinnamomi* [*R.A.M.*, xiv, pp. 147, 264], inoculations with which on potted red pine plants were followed by the typical dry bark rot involving the whole root system and sometimes extending several inches up the stem. Conspicuous features of the disease are the dark coloration of the wood and the copious resin exudation associated with vascular infection, while large pith pockets are also commonly formed in the wood. The other fungi found in the root and collar lesions on red pine, viz., species of *Pestalozzia*,

Sphaeropsis, *Sclerotium*, and *Rhizoctonia*, produced resiniferous areas and sometimes death, but not the characteristic symptoms of the *Phytophthora* disease.

KIMMEY (J. W.). **Susceptibility of principal Ribes of southern Oregon to White-Pine blister rust.**—*J. For.*, xxxiii, 1, pp. 52–56, 1935.

The rapid spread of white pine [*Pinus monticola*] blister rust (*Cronartium ribicola*) in northern and central Oregon necessitated a study of the reaction to the fungus of the important species of *Ribes* [cf. *R.A.M.*, xii, p. 407; xiv, p. 66] found in the valuable sugar pine (*Pinus lambertiana*) stands of the southern part of the State with a view to the planning of control measures. To this end a total of over 300 plants of *G*[*rossularia*] [*Ribes*] *klamathensis*, *R. marshallii*, *R. sanguineum*, *R. hallii*, *R. binominatum*, *R. erythrocarpum*, *R. velutinum*, and *R. cruentum* were set in 1930 in an experimental garden in the Mt. Hood National Forest where severe infection had already been observed on *P. monticola*. In 1931 and 1933 the plants were exposed to natural infection from the neighbouring diseased trees, and in 1932 they were heavily inoculated with aecidiospores from western white pine cankers.

All the species were found to be highly susceptible to infection with the exception of *R. hallii*, and all (including the latter) produced a large or moderate number of teleutosori on the diseased leaves. Any effective control programme would thus involve the eradication of all the alternate hosts used in these trials.

HUNTER (LILLIAN M.). **A preliminary note on life history studies of European species of Milesia.**—*J. Arnold Arbor.*, xvi, 1, p. 143, 1935.

The author states that during her studies of the life-history of fern rusts in England she was successful in obtaining spermogonia and aecidia of *Milesia scolopendrii* and *M. polypodii* on *Abies alba* and *A. concolor*, and of *M. vogesiaca* and *M. kriegeriana* on these two hosts as well as on *A. grandis* [cf. *R.A.M.*, xiii, pp. 412, 656].

RAYNER (M. C[HEVELEY]). **Mycorrhiza in relation to forestry. I. Researches on the genus Pinus, with an account of experimental work in a selected area.**—*Forestry*, viii, 2, pp. 96–125, 13 pl., 1934.

In a detailed study [which is fully described] of the physiological relations between mycorrhiza and host in *Pinus* seedlings [*R.A.M.*, xiii, p. 530], small field plots were laid out in a locality in the south of England where sowings of *Pinus* had yielded poor and inconsistent results, the method adopted involving the application of humus inoculum known to contain active mycorrhizal material and the checking of the results by similar applications to pot cultures in a sterilized soil known to be favourable to growth and mycorrhiza production.

The root systems of many of the seedlings already present in the area selected were very defective, the younger regions of the roots tending to rot with no definite symptom of fungal attack; mycorrhizas were absent or abnormal. Humus inoculations containing active mycorrhiza of the species concerned were carried out on *P. sylvestris*, *P. laricio*, and *P. pinaster* before sowing, material to treat the Scots pine being obtained from Sweden and Ireland and that for the other two species from

Corsica. The result of the inoculation was improved growth and mycorrhiza formation by the seedlings, which in marked contrast to the controls continued to make steady growth, the needles being green and of normal length and the root systems well branched with freely developed mycorrhizas of the same structural types as those in the inoculum. The beneficial effect was general, indicating that the stimulating effects were due to biological factors rather than to manuring. Similar results were obtained on Scots pine growing in a sterilized rooting medium.

Observations showed that while mycelium of one or more fungi capable of forming normal mycorrhiza with all the pines studied was naturally present throughout the area concerned, soil factors inimical to its symbiotic activity and proper functioning were responsible for the condition of the original sowings. This conclusion was confirmed by the reaction of the seedling roots in field plots and in pot cultures of the same soil subjected to treatments (e.g., with phosphatic fertilizers) designed to remedy this hypothetical soil condition.

Results in the field and laboratory provided independent proof of the extreme sensitiveness of young tree roots to environmental conditions affecting nutrition and mycorrhiza development. In the soil of the area concerned the sickly state of the plants was largely due to nitrogen starvation. Experiments with inorganic nitrogenous fertilizers showed that it was difficult to make up for deficiencies in this way without serious disturbance of the root-shoot growth ratio in certain species of pine, but it was demonstrated that the nutrient requirements of the young trees are met by a proper mycorrhiza development.

It was found that certain organic composts prepared so as to remove much of the cellulose and provide a dressing rich in proteins, nucleic acid compounds, and lignin had a remarkable effect in the soil in question in stimulating the development and degree of branching of the long roots; sublaterals were freely produced, and mycorrhiza formation was no longer inhibited. In general, the results supported the hypothesis that inhibition of mycorrhiza formation in the area concerned was conditioned by the organic constituents of the soil and could be relieved by treatments modifying them. The results also showed that the organic composts that brought about these changes could be used effectively for studying the mycorrhizal activity of coniferous seedlings in response to variation in the root environment.

Liese (J.), Nowak (A.), Peters (F.), & Rabanus (A.). **Toximetrische Bestimmung von Holzkonservierungsmitteln. Zusammenfassender Bericht.** [The toximetric determination of timber preservatives. Summary report.]—*Beih.* '*angew. Chem.*', 11, 18 pp., 8 figs., 1 diag., 2 graphs, 1935.

Further particulars are given of the methods officially adopted at the International Conference of Mycologists and Wood Preservation Technicians held in Berlin in June, 1930, for the toximetric determination of timber preservatives [*R.A.M.*, x, p. 356; xiv, p. 3], and the results of tests of these methods since carried out on a co-operative basis at several centres are discussed.

The following fungi were selected as suitable for experimental use:

Coniophora cerebella [*C. puteana*], *Polyporus vaporarius* [*Poria vaporaria*], *Lenzites abietina*, *Lentinus squamosus* [*L. lepideus*], *Polystictus versicolor*, and *Daedalea quercina*, pure cultures of which are obtainable from the silvicultural plant protection headquarters (Hauptstelle für forstlichen Pflanzenschutz) at Eberswalde, Germany. As a result of the experience gained it is recommended that the determination of the amount of decay in the test-blocks should be made by two methods, gravimetric and manual, according to the requirements of the case. The gravimetric method should be used on beech, the manual on pine, and both on all other woods pending a decision as to the more convenient technique in a given case.

Details of both methods are furnished. All tests should be made in glass flasks, Kolle flasks of standard dimensions being recommended. In the gravimetric method a series of wood-blocks, weighed to tenths of a gramme after drying at 105° C. to a constant dryness, are impregnated with various quantities of the preservative to be tested and placed, together with one untreated, weighed block to each series, in the flasks on pure cultures of the wood-destroying fungi. The following groups of substances are suitable for wood preservation tests: (*a*) water-soluble substances in aqueous solution; (*b*) substances insoluble in water in appropriate solvents (e.g., acetone); and (*c*) substances insoluble in water—especially oils—or solutions of such substances in appropriate fluids, in aqueous emulsion. For 10 to 20 minutes the blocks should be immersed in the test preparation under a vacuum of 60 to 65 cm. of mercury, on the removal of which they should continue to lie in the fungicide until completely saturated. They are then weighed to tenths of a gramme to ascertain the quantity of the solution absorbed. Where organic solvents have been used the impregnated blocks must be exposed to air until the solvent is dispelled as completely as possible. At the end of a given time (three to four months) after inoculation the blocks are removed, freed from the adhering mycelium, and again weighed to tenths of a gramme at their original degree of dryness, which is attained by several hours' heating at 105° and cooling in an exsiccator, the loss of weight being the criterion for the extent of wood destruction. Details are given of the methods recommended to calculate the loss, if any, due to evaporation or otherwise during the test of some of the material used for impregnating. The manual method consists merely in the impregnation of the air-dried blocks under controlled conditions as already indicated, and the estimation, by observation and manipulation, of the amount of injury caused after a given period by the test fungi. Five grades of decay are recognized, from none to full destruction.

Malt extract agar (50 and 30 gm., respectively, brought up to 1,000 gm. with distilled water) has been found to constitute a suitable medium for the cultures of the wood-rotting fungi, the methods of establishing which are briefly indicated. They are ready for use in one to two weeks after subculturing. The impregnated blocks are kept from lying directly on the medium by glass rods so as to prevent diffusion of the antiseptic into the medium. Pine sapwood is the most generally useful material for timber preservative trials, but any other kind of wood may be employed as circumstances dictate, e.g., beech for *P. versicolor* [see next abstract]. A block size of $1{\cdot}5 \times 2{\cdot}5 \times 5$ cm. is con-

venient. The experimental flasks should be kept at a temperature of 18° to 22° and a relative humidity of 60 to 70 per cent., and shielded from direct sunlight. In the gravimetric method a loss of weight equivalent to at least 5 per cent. must be sustained before the block is considered to be attacked, while in the case of the manual technique the disintegration of the wood must be plainly recognizable to warrant a report of infection by a given fungus. The toxicity limit is calculated as the interval between the concentration of a preservative permitting decay and that inhibiting it, expressed in kg. per cu. m. of wood.

Jay (B. A.). **A study of Polystictus versicolor.**—*Kew Bull., 1934*, 10, pp. 409–424, 2 pl., 3 figs., 2 graphs, 1934.

Polystictus versicolor [*R.A.M.*, x, p. 343; xiii, p. 485] is stated to be responsible for most of the rotting of felled and structural hardwoods under damp conditions in Great Britain, where it is extremely widespread and has even been recorded to cause rot in the wooden frames of car bodies. It has not been observed by the author on living trees although reported in America as the cause of a heart rot canker in apple and pear trees [ibid., vi, p. 167]. On 2 per cent. malt agar the fungus entirely decolorized the medium in three or four weeks, this being considered a useful test in identifying the fungus. Diploid mycelium was formed only when two monosporous cultures were grown together. The spores retain their viability for considerable periods (at least for three months when kept dry on a cover slip). Maximum growth occurred at P_H values between 4·6 and 5·6, no growth taking place below P_H 3 or above 7·3. The lowest temperature necessary to kill the fungus in 15 minutes was 60° C. in culture and 65° in wood. In culture the fungus appeared to grow slightly better in darkness than in light.

In artificially inoculated blocks of elm and oak wood, *P. versicolor* penetrates along the vessels and the medullary rays, the latter being the first to be attacked; later the wood parenchyma cells are affected and the smaller vessels are filled with dense strands of hyaline hyphae greatly varying in size; clamp-connexions are somewhat less frequent than in artificial cultures, and 'medallions' are very rare. The host cells appear to be penetrated equally easily by the hyphae both through the pits and through their walls. Zone lines, caused by the accumulation in the wood elements of a reddish-brown gummy substance, were only observed in oak. The haploid mycelium arising in monosporous cultures was shown to attack and rot wood as vigorously as the diploid.

The results of tests [which are briefly described] of the reaction of the fungus to sodium fluoride, creosote, zinc chloride, and formalin vapour, showed that creosoting is the best preventive of this form of rot. Early removal from the forest and drying of the felled tree trunks is very advisable. Where creosoting is not possible, e.g., in the construction of car bodies, impregnation with 4 per cent. sodium fluoride is recommended; this should be effective so long as the wood is kept from contact with water.

Latham (J.) & Armstrong (F. H.). **The mechanical strength properties of 'brown' Oak.**—*Forestry*, viii, 2, pp. 131–135, 1934.

Experiments at the Forest Products Research Laboratory, Princes

Risborough, made to determine the effect of the condition known as 'brown oak' [*R.A.M.*, xiv, p. 136] on the mechanical properties of the timber showed that while partially infected wood did not differ in strength or density from normal oak, completely infected wood, though equal in density to timber from normal trees of the lowest weight and strength found, was markedly softer and more brittle. It is, therefore, assumed that the fungus associated with the condition has only very feeble wood-destroying properties in the early stages of infection.

Ogilvie (L.) & Mulligan (B. O.). **Vegetable diseases : a survey of recent work at Long Ashton.**—*Sci. Hort.* [formerly *H.E.A. Yearb.*], iii, pp. 119–125, 6 figs., 1935.

Short, popular notes are given on diseases of asparagus, beans [*Phaseolus vulgaris*], leeks, lettuce, mint, peas, and vegetable marrow observed chiefly in the Evesham and Cheltenham areas of Bristol Province since September, 1932. Much of the information given has already been noticed from another source [*R.A.M.*, xiii, p. 667].

Potts (G.). **Experiments on finger-and-toe disease (Plasmodiophora brassicae).**—*Trans. Brit. mycol. Soc.*, xix, 2, pp. 114–127, 1935.

In the experiments described in some detail in this paper (a preliminary account of which was given at the British Association in Johannesburg in 1905) negative results were obtained from all attempts to infect with *Plasmodiophora brassicae* certain plants nearly related to the Cruciferae or having a similar ash composition, including *Reseda odorata*, *Corydalis glauca*, *Fumaria officinalis*, *Allium schoenoprasum*, *Urtica pilulifera*, and spinach. Among the Cruciferae, the injury done by the organism depends on the host species and its age at infection; in diseased roots of species not obviously injured by the tumour formation, the vessels were found to be enclosed in a hard central fibrous strand, and not to be disturbed by the pathological cell proliferation of the surrounding parenchyma, while in species that showed considerable direct injury the continuity of the vessels was broken. The tests also showed that the development of the disease is promoted by acidity and checked by alkalinity of the soil, and that it can be entirely prevented by applications of quicklime to the growing crop, provided the dressings are sufficiently large and frequently repeated; besides its effect on soil reaction lime controls the disease in some other, as yet unknown, manner, this effect taking a considerable time to become apparent. While highly calcareous soils are not immune from the disease, those that are naturally rich in calcium are much less subject to it than those that are deficient. Applications of sulphate appeared to encourage the development of club root, as judged by its earlier appearance. Organic matter may also encourage the disease by favouring the retention of soil moisture. The spores of *P. brassicae* were shown to be able to infect plants to a depth of 12 inches in the soil.

Blank (L. M.). **A mosaic on Cabbage in Wisconsin.**—Abs. in *Phytopathology*, xxv, 1, p. 6, 1935.

Mosaic has been found to be prevalent on cabbage in the field in south-eastern Wisconsin, where the symptoms of the disease include

faint or conspicuous mottling and necrosis and shedding of the lower affected leaves. Transmission has been accomplished by aphids and plant juice. Plants affected early in the season are liable to stunting.

De Bruyn (Helena L. G.). **Heterothallism in Peronospora parasitica.**—Abs. in *Phytopathology*, xxv, 1, p. 8, 1935.

No appreciable differences in pathogenicity to cabbage seedlings or growth rate were observed between eleven single-spore isolations from *Brassica* of *Peronospora parasitica* [*R.A.M.*, xiv, p. 1], but there were distinct variations in oospore development. Three strains were homothallic, producing an abundance of oospores under suitable conditions. Seven behaved unisexually, forming oospores only on contact with a strain of the opposite thallus group. The eleventh was fertile in a small percentage of the tubes either alone, with another strain of the same group, or (more abundantly) with a strain of the other group. This strain, therefore, was potentially bisexual with one sex predominating. Of the eight heterothallic strains, four belonged to one group and four to the opposite, as proved by intercrossing.

Osborn (H. T.). **Incubation of the virus of Pea mosaic in the aphid, Macrosiphum gei.**—Abs. in *Phytopathology*, xxv, 1, p. 31, 1935.

The pea mosaic virus, which has already been shown to require some twelve hours' incubation in the aphid *Macrosiphum pisi* before transmission by this carrier [*R.A.M.*, xiii, p. 414], has been found to undergo a similar period (12 to 18 hours) of maturation in *M. gei*. A second virus affecting peas and other legumes, designated pea mosaic virus No. 2, is readily transmissible by mechanical means and is also spread by both the above-mentioned aphids. *M. pisi* transmits the latter virus (apparently by mechanical means) within 30 minutes of acquiring it, and does not usually retain it for more than an hour.

Suit (R. F.). **Preliminary report on investigations of bacterial blight of Beans.**—*Rep. Quebec Soc. Prot. Pl., 1932–1934*, pp. 75–79, 1934.

Field observations in Quebec showed that the principal bacterial blight of beans [*Phaseolus vulgaris*] present locally is that due to *Pseudomonas* [*Bacterium*] *phaseoli*. Rainfall appeared to be the determining factor in the seasonal development of the disease [*R.A.M.*, xii, p. 415]. All of seven named varieties tested were susceptible except the late maturing Scotia. The Tepary bean (*P. acutifolius* var. *latifolius*) also showed resistance. The rogueing of susceptible varieties gave no control, but selections of plants showing the least disease among seven varieties grown in 1933, resulted in obtaining 5 to 30 selections from each variety which are to be further tested for resistance.

Stapp (C.). **Fortgeführte Untersuchungen über die Resistenzverschiedenheiten von Bohnen (Phaseolus vulgaris) gegen Pseudomonas medicaginis var. phaseolicola Burk.** [Further investigations on the differences in resistance of Beans (*Phaseolus vulgaris*) to *Pseudomonas medicaginis* var. *phaseolicola* Burk.]—*Angew. Bot.*, xvii, 1, pp. 23–42, 1 fig., 1935.

Absolute resistance to grease spot (*Pseudomonas* [*Bacterium*] *medicaginis* var. *phaseolicola*) was shown in the writer's further varietal tests

on samples of varying origin [*R.A.M.*, xiii, p. 557; xiv, p. 72] by Kaiser Wilhelm, Doppelte holländische Prinzess (with which Zucker-Butter-Brech may be identical), Zucker Perl, Schwert (Hamburger Markt, Nordstern, and Holländische), Mombacher Juni, Marktsieger, Wachs Black Roman string, Wachs Neger, Wachs Flageolet (red and dark purple beans), standard Schlachtschwert (Sachs), stringless Krummschnabel, stringless Konserva (Mette), Konserva, Konservanda Original Sachs, Mohrenweisers Wunder-Butter-Wachs, and climbing earliest Inexhaustible (Mette). Marked susceptibility again characterized Non Plus Ultra, the majority of the Hinrichs Riesen samples, Ilsenburg speckled, Flageolet St. Andreas and rote Pariser, Wachs Dattel, and (in contradiction of previous results) Wachs Mont d'Or.

Wingard (S. A.). **Host-parasite relationship in Bean rust.**—Abs. in *Phytopathology*, xxv, 1, p. 39, 1935.

Histological study shows that the bean [*Phaseolus vulgaris*] varieties commonly regarded as resistant to rust [*Uromyces appendiculatus*: *R.A.M.*, xiii, p. 205] are actually hypersensitive. In such plants the leaf tissues succumb to invasion by the fungus and destroy the latter before spores can be produced. In susceptible varieties, on the other hand, the invaded tissues are not killed by the rust but stimulated and preserved at the expense of the sound ones. The invaded host cell colonies, together with the encroaching hyphae, are considered to constitute parasitic units living at the expense of the surrounding healthy tissue. This symbiotic relationship between rust hyphae and host cells continues until after spore production and the consequent inability of the plant tissues to supply further nourishment.

Andrus (C. F.) & Moore (W. D.). **Colletotrichum truncatum (Schw.), n.comb., on garden and Lima Beans.**—*Phytopathology*, xxv, 1, pp. 121–125, 2 figs., 1935.

A Latin diagnosis is given of *Colletotrichum truncatum* (Schw.) n.comb. (syn. *Vermicularia truncata* Schw., *V. polytricha* Cke, and *C. caulicolum* Heald & Wolf [*C. caulicola*: *R.A.M.*, xi, p. 149]), which causes a reddish, later light-brown or greyish stem and pod blight on garden and Lima beans (*Phaseolus vulgaris* and *P. lunatus*) in the southern and eastern United States. The fungus is characterized by black, hemispherical, rugulose acervuli, mostly horizontally truncate, more rarely irregularly conical-truncate; abundant filiform setae of very variable length (60 to 300 by 3·5 to 8 μ); and falcate, lanceolate, hyaline conidia, 18 to 30 by 3 to 4 μ. Numerous dark sclerotial bodies simulating pycnidia are produced by the organism, but true pycnidia have not been observed in any of the material examined.

Weber (G. F.). **An aerial Rhizoctonia on Beans.**—Abs. in *Phytopathology*, xxv, 1, p. 38, 1935.

During the past two years beans [*Phaseolus vulgaris*] have been attacked in Florida by a disease similar to that produced on the fig [in the same State] by *Rhizoctonia microsclerotia* [*R.A.M.*, iv, p. 443] and probably identical with a blight of the Japanese varnish tree, *Firmiana simplex*. All the aerial parts of the bean are affected, the symptoms

being most evident on the foliage. The leaf blades are killed from the base as the fungus spreads over them in typical thread blight fashion from the stem and petiole. The hyphae appear to be both subcuticular and superficial, the former invading and killing the host cells while the latter extend over the laminae. The attacked areas first appear scalded and then dry out, often turning brown. Beans were not hitherto known to suffer from this disease, other hosts of which include Fordhook Lima beans [*P. lunatus*], *Xanthium americanum* [*X. canadense* Mill.], and *Glycine apios* [*Apios tuberosa* Moench]. The sclerotia formed in nature on bean and fig are similar.

Schmidt (E. W.). **Das Vergilben der Zuckerrübenblätter.** [The yellowing of Sugar Beet leaves.]—*Dtsch. Zuckerindustr.*, lx, 1, p. 20, 1935.

In addition to the normal yellowing of sugar beet leaves accompanying senescence, a number of other agencies may produce exactly the same effect, including mosaic, parasitic fungi, nutritional deficiency (primarily of nitrogen, then of potash), smoke injury, intense sunlight (reported only from the vicinity of Madrid), and the disease known in Holland as yellowing, ascribed by Quanjer to a virus [*R.A.M.*, xiv, p. 209]. An analysis is given of the chemical processes involved in senescence, based on the writer's studies at the Kleinwanzleben (Germany) Research Institute.

Stuart (W. W.) & Newhall (A. G.). **Further evidence of the seed-borne nature of Peronospora destructor.**—Abs. in *Phytopathology*, xxv, 1, p. 35, 1935.

After repeated failures in the greenhouse to obtain diseased seedlings from onion seed suspected of carrying *Peronospora destructor* [*P. schleideni*: *R.A.M.*, xii, p. 484], the writers inoculated in the autumn flowering seed heads of Yellow Globe with a conidial suspension of the fungus, natural infection by which also occurred freely from a neighbouring field. In the following spring seed from the infected heads was sown in two isolated virgin muck fields, in one of which, surrounded on three sides by dense woodland and 1,200 ft. distant from the nearest onion stand, mildew developed simultaneously with its appearance in other local commercial plantings.

Drechsler (C.). **Occurrence of a species of Aphanomyces on roots of Spinach and Flax.**—Abs. in *Phytopathology*, xxv, 1, pp. 14–15, 1935.

A species of *Aphanomyces* probably identical with *A. cladogamus* has been isolated from the discoloured roots of spinach in Virginia and New Jersey and flax in Wisconsin. The dimensions of the newly observed species agree closely with those of *A. cladogamus*, while the oogonial and antheridial relations are also similar in both. The yellowish to orange spotting on the root surface is accompanied by a considerable degree of softening, but no general decay was noticeable at the time of collection.

Cook (H. T.). **Occurrence of oospores of Peronospora effusa with commercial Spinach seed.**—Abs. in *Phytopathology*, xxv, 1, pp. 11–12, 1935.

Commercial spinach seed of different varieties and origins was found

to have an admixture of oospores of *Peronospora effusa*, the agent of downy mildew [*R.A.M.*, xiv, p. 141], to a maximum extent of one oospore to 8½ seeds. The crop grown from heavily infested seed in 1932 was badly damaged by the mildew, as also was that raised from the same lot of seed planted on new land in 1933.

STAPP (C.). **Eine bakterielle Fäule an Lactuca sativa var. capitata L. und Cichorium endivia L.** [A bacterial rot of *Lactuca sativa* var. *capitata* L. and *Cichorium endivia* L.]—*Zlb. Bakt.*, Abt. 2, xci, 11–15, pp. 232–243, 3 figs., 1935.

Particulars are given of a rot of head lettuce and endives in central Germany, of a similar general character to that previously described on the latter host by W. Kotte as due to *Pseudomonas endiviae* [*R.A.M.*, ix, p. 503]. The dimensions of the uni- to pluriflagellate, Gram-negative, green-fluorescent organism isolated in the present studies from both plants varied considerably on different media, averaging 1·4 to 2·8 by 0·4 to 0·5 μ, 1·0 to 2·8 by 0·4 to 0·5 μ, and 1·2 to 2·2 by 0·5 to 0·6 μ on bouillon, potato, and carrot agars, respectively. The optimum temperature for the development of the bacterium lies between 23° and 28° C., with a minimum below 0°, a maximum from 40° to 42°, and a death point of 51° to 52°. Milk is coagulated by the bacterium, which further causes strong denitrification. The organism being also pathogenic to chicory, it is believed to be in all probability identical with *P. intybi*, described by D. B. Swingle from the United States [ibid., v, p. 275]. Lettuce was also infected in inoculation tests by *P. syringae* both from lilac and *Chrysanthemum indicum* [ibid., xiv, p. 38], and serological tests indicated a certain affinity between the lettuce organism and other fluorescent species such as *P. syringae*, *P.* [*Bacterium*] *lacrymans*, and *P. tabaci* [*Bact. tabacum*].

NELSON (R.) & COCHRAN (L. C.). **Three forms of the Fusarium wilt of Celery.**—Abs. in *Phytopathology*, xxv, 1, p. 29, 1935.

A form of the *Fusarium* wilt or yellows of celery differing from the two commonly known in Michigan and elsewhere [*R.A.M.*, xiv, p. 142] has recently been found in California. Of the two widely distributed forms, (1) is characterized in the initial stages by a progressive yellowing of the lamina (primarily the interveinal areas), and absence of curling, while in (2) downward curling of the leaflets is conspicuous, accompanied by blanching of the veins and a narrow band of immediately adjacent tissue. The new form (3) involves neither curling nor discoloration of the leaflets but causes dwarfing and other symptoms [see next abstract].

NELSON (R.) & COCHRAN (L. C.). **Taxonomy of the Fusaria that cause Celery wilt (yellows).**—Abs. in *Phytopathology*, xxv, 1, p. 29, 1935.

Two of the groups of *Fusarium* strains associated with celery wilt or yellows have been found to be morphologically indistinguishable both from one another and from other parasitic members of the subsection *Orthocera*, which differ mutually only in certain minor details. Their specific separation on the grounds of the slight and variable differences in spore size appears to be unwarranted. The logical taxonomic procedure would be to recognize only one species of this

subsection, viz., *F. lini* [*R.A.M.*, xiv, p. 310]. This treatment, however, being unsatisfactory alike to systematists and phytopathologists, it is proposed to make host relationships the primary basis in the classification of the parasitic *Fusaria*. On this basis the two well-defined groups of celery *Fusaria* are named *F. apii* and *F. apii* var. *pallidum*, while a third group [see preceding abstract] requires further study.

Korff (G.) & Böning (K.). **Die Meerrettichschwärze und ihre Bekämpfung.** [Blackening of Horse-radish and its control.]—*Prakt. Bl. Pflanzenb.*, xi, 9–10, pp. 273–277, 2 figs., 1934.

Notes are given on the destructive 'blackening' disease of horse-radish caused by *Verticillium dahliae* [*R.A.M.*, vii, p. 357 and next abstract] in Germany and on its control by appropriate cultural measures.

Klebahn (H.). **Untersuchungen über Krankheiten des Meerrettichs.** [Investigations on Horse-radish diseases.]—*Z. PflKrankh.*, xlv, 1, pp. 16–41, 15 figs., 1935.

The two principal horse-radish diseases on the Elbe island of Finkenwärder, Germany, are stated to be a black rot of the roots and white rust [blister] (*Cystopus candidus*). The author's studies show that the former disease is not attributable to *Verticillium dahliae*, found by Korff and Böning and others to cause a wilt of the crop [*R.A.M.*, vii, p. 357; ix, p. 156 and preceding abstract]. Hyphae resembling those of *V. dahliae* were detected in the vessels in a few cases, but never in association with the typical blackening of the root, nor were its characteristic minute sclerotia present. Other organisms were also present but the results of inoculations with them have so far been inconclusive, so that the cause of the disease remains obscure.

C. candidus was observed to overwinter in the roots in the form of a perennating mycelium [ibid., xi, pp. 490, 688], the individual hyphal elements of which are thick-walled, often curved, bent, or branched, with spherical swellings at the ends and elsewhere, and measuring 8 to 12 μ in diameter. Haustoria are formed from the intercellular hyphae.

The control of the blackening disease should be based primarily on the selection of healthy material for cuttings, while white blister, which spreads from leaf to leaf, may be combated by spraying with Bordeaux mixture.

Leach (J. G.) & Currence (T. M.). **Resistance to Fusarium wilt in Muskmelon.**—Abs. in *Phytopathology*, xxv, 1, p. 25, 1935.

Muskmelon wilt (*Fusarium*) [*niveum*: *R.A.M.*, xiv, pp. 86, 216, 220] is stated to be spreading continuously in the Minneapolis and St. Paul districts of Minnesota [ibid., xii, p. 744], where the disease, first observed in 1931, occurs in a very destructive form. Partial resistance has been shown in varietal trials by Honeydew and Persian, the remaining common commercial sorts being very susceptible. One of some 30 plants selected in 1932 from a field of the Golden Osage type was apparently a hybrid between Golden Osage and Honeydew, and in 1933 it yielded a number of resistant plants, from which further selections have been made.

Orton (C. R.). **Dissociation of Fusarium niveum in soil.**—Abs. in *Phytopathology*, xxv, 1, pp. 30–31, 1935.

Forty-two 2-litre Erlenmeyer flasks half-filled with sandy-loam greenhouse soil were sterilized and infested with nine strains of *Fusarium niveum* [the agent of melon wilt: see preceding abstract] in March and August, 1933, six further flasks being left untreated as controls. Sixteen of the flasks were placed in the laboratory, 16 in a greenhouse, and 16 in a 6-in. soil trench out-of-doors. At approximately monthly intervals samples were removed from each flask and plated on agar. Each colony thus obtained was studied in comparison with its respective 'parental' strain and three groupings made, viz., (1) colonies like parental strain; (2) colonies unlike parental strain ('colony dissociants'); and (3) colonies showing sectorial dissociation. In the 8,220 colonies isolated from the 48 flasks, colony dissociants appeared 25 and sectorial dissociants 16 times from seven strains; twelve of the colony and thirteen of the sectorial dissociants were distinctive, the remainder being replications.

Young (P. A.). **Sclerotinia rot of Pumpkin and Squash.**—Abs. in *Phytopathology*, xxv, 1, pp. 39–40, 1935.

Field and storage decay of pumpkins and squashes due to *Sclerotinia sclerotiorum* was reported from Montana in 1933 [cf. *R.A.M.*, viii, p. 419]. Affected squashes showed disk-shaped, water-soaked spots, 2 to 10 cm. wide, the margins of which were often studded with droplets of a yellow exudate, while the centres sometimes bore a white mycelium. Many large sclerotia were found in the dried mummies. In pumpkins the rot was of the soft, liquid type and was associated with dense mycelial production, numerous black sclerotia being also formed, up to 15·5 cm. in length and 12 cm. in breadth.

Zacharewicz (E.). **La Truffe. Sa culture.** [The Truffle. Its cultivation.]—*Progr. agric. vitic.*, ciii, 1, pp. 10–14; 3, pp. 59–62, 1935.

This is a summarized account of the methods employed in the Vaucluse department of France for the artificial establishment of truffle-producing woods, chiefly of species of oak; it is pointed out, however, that some other trees such as, for instance, the pine, poplar, and hazel, are also suitable for this purpose. In well-established and well-maintained woods the productivity in truffles may be as high as 100 kg. per hect. per annum.

Branas (J.) & Bernon (G.). **Époque des traitements du mildiou de la vigne.** [Date of treatments against Vine mildew.]—*Ann. Éc. Agric. Montpellier*, N.S., xxiii, 2, pp. 67–95, 1 fig., 3 graphs, 1934.

After discussing the two methods of predicting attacks of vine mildew [*Plasmopara viticola*] at present in use in the French forecasting stations [cf. *R.A.M.*, iii, p. 468; xii, p. 73], the authors describe a new technique based mainly on data afforded by the vine itself, and depending on biometrical, pathological, climatological, and cultural factors.

Details are given of a method of calculating the ratio of unsprayed to sprayed leaf area. The number of applications required depends primarily on vegetative vigour, as this determines the vine's growth rate and amount of unsprayed (new) surface. Other things being equal, the

applications should be effected at intervals corresponding to a definite increase in branch length, i.e., 14 treatments made on a branch which finally reaches a length of 220 cm. should be given at intervals corresponding to an increase in branch length of 15 cm.

As regards the pathological factors, even after the first invasion from the soil, few, if any, lesions are present; after the first onset following the 7 to 10 days' incubation period, a new attack occurs, and as a rule becomes generalized throughout the vineyard. Thus (provided the atmospheric temperature is high enough for infection to occur), the third contaminating shower, coming at least 16 days after the one responsible for the initial outbreak, is the first dangerous one, before which, even in circumstances favouring infection, spraying is unnecessary. Directly favourable conditions prevail, fresh conidia are produced in a few hours, their abundance depending on the number, size, and condition of the lesions.

These factors exercise an indirect influence on the number of applications required. If only very few conidia are present in a wide area round the vineyard only one application need be made for each 25 or 30 cm. increase in branch length. When no conidia are present only the first few applications are necessary.

Climatological factors, by influencing the growth rate of the vines and the number of conidia produced, also indirectly affect the frequency with which spraying is required. Low atmospheric temperatures assist control both by reducing conidial production and by lessening the vine's growth rate; high temperatures dry up the conidia but stimulate vegetation. High atmospheric humidity favours infection by increasing the turgescence and sensitiveness of the vine tissues and assisting the liberation and conservation of the conidia. Rain, by reducing the atmospheric temperature, reduces the growth rate of the vines, but it also increases spore production. The most important factor in this connexion is the length of time the rain drops persist on the herbaceous organs, a prolonged light drizzle being much more dangerous than a sharp, heavy shower.

Assuming it to be established that it is dangerous to leave 15 cm. branch growth untreated, the investigations at Montpellier have shown that vines whose average branch length finally exceeds 2·30 m. require at least 17 applications to secure complete protection, the corresponding numbers for branch lengths of 1·8 to 2·3 m. and under 1·8 m. being 13 to 17 and under 12, respectively. Once the fruit bunches can no longer be reached by liquid sprays, recourse must be had to dusting.

Branas (J.) & Dulac (J.). **Sur le mode d'action des bouillies cupriques.** [On the mode of action of cupric mixtures.]—*Ann. Éc. Agric. Montpellier*, N.S., xxiii, 2, pp. 104–114, 1934.

Further investigations [which are fully described] into the mode of action of the copper compounds used against *Plasmopara viticola* [*R.A.M.*, xiv, p. 75], mainly in order to explain their failure in seasons of severe infection, showed that although the copper spray fluids in general use do contain enough copper (over 1 part in 100,000) [ibid., xiii, p. 423] to be toxic to the conidia of *P. viticola* when freshly prepared, the desiccated deposits do not, with certain exceptions, release this proportion of soluble copper when in contact with rain water. The

exceptions are (1) mixtures which do not dry up (which explains the effectiveness of spraying during moderate rain), (2) Burgundy mixtures which have become desiccated slowly and Bordeaux mixtures which have dried rapidly (though this solubility does not persist), and (3) deposits which come into contact with very acid rain water (P_H 4·6).

Scurti (F.) & Pavarino (G. L.). **Sulla scottatura dell' Uva. Esperienze eseguite sull' Uva Regina.** [On Grape scald. Experiments on Regina Grapes.]—*Ann. Sper. agr.*, xv, pp. 19–22, 3 col. pl., 1934.

The grape trouble known as 'scottatura' [scald], which occurs sporadically in various countries, consists in an alteration of the skins of the berries produced by excessive sunlight or mechanical injuries at times of intense heat. The affected berries are dark and noticeably wrinkled. The authors' studies [which are described] showed that the condition is the result of a photochemical process which causes the chloroplasts and tannic materials in the cells of the skin to become disorganized; a further cause is high temperature, which produces coagulation and discoloration of the cell contents. In cold storage conditions the disorder is arrested, but as soon as the grapes are brought back into ordinary temperatures it again becomes active and fungal decays set in.

Scurti (F.) & Pavarino (G.). **L'anidride solforosa nella conservazione delle Uve da tavola.** [Sulphur dioxide in the preservation of table grapes.]—*Ann. Sper. agr.*, xv, pp. 79–90, 7 col. pl., 1934.

A full account is given of experiments in which 15 varieties of table grapes in cold storage were exposed for one hour to a current of air containing 2 per cent. by volume of sulphur dioxide [*R.A.M.*, xii, p. 46], all trace of the gas being subsequently removed by ventilation, and the treatment repeated after 15 days and again at intervals of not less than 10 days, whenever any trace of mould development appeared.

With all the varieties tested the disinfection inhibited the development of moulds; it had, however, particularly with certain varieties, an adverse effect on the grapes, causing the berries at the top of the bunch to turn yellow in the part round the peduncle, this discoloration later darkening and spreading uniformly over half the surface of the berry. At the same time the juice became unpleasantly acid. In the susceptible varieties (which included Ohanez) it exercises a caustic and reducing action on the tissues, resulting in discoloration of the green organs and skin, with extensive burning. Under cold storage conditions these effects are followed by disorganization of the chloroplasts, alteration of the vascular system, and plasmolysis of the cells. The effects of the gas extend as far as the outer envelope of the seed. When such grapes are brought into room temperatures, breakdown of the tissues rapidly ensues. Black varieties are slightly more resistant to these effects than white ones.

Report on the work of the Agricultural Research Institutes and on certain other agricultural investigations in the United Kingdom, 1932–1933. —375 pp., 1935.

In this compilation (prepared on the same lines as that of the preced-

ing year) [*R.A.M.*, xiii, p. 214], greatly condensed accounts are included of the phytopathological work in progress at the various research stations, the laboratories of the Ministries of Agriculture for England and Northern Ireland, and the Department of Agriculture for Scotland, as well as the local investigations at advisory centres throughout the United Kingdom. Most of the information in question has already been noticed in this *Review* from other sources.

Salmon (E. S.) & Ware (W. M.). **Department of Mycology.**—*J. S.-E. agric. Coll., Wye*, xxxv, pp. 17–29, 2 figs., 1935.

In 1933, a severe attack of *Rhizoctonia* [*Corticium*] *solani* on the sprouts of early potato varieties on a Kentish farm led to a reduction in the net profit from the four-acre crop of the early varieties estimated at £70. In another attack by the same fungus on Arran Banner potatoes on Romney Marsh, sclerotia and mycelium were abundantly present on the roots and the white mycelium of the *Corticium* stage was found on the stems up to 3 in. above ground level and on some of the lowest leaves and petioles. Although the usual symptoms of *Rhizoctonia* infection in the early part of the season (dwarfing or stunting of the haulm and damage to the sprouts before they penetrate the soil) were not observed, the roots had apparently become infected sufficiently to cause the foliage to turn yellow.

During the summer several cases of failure in pea crops due to a *Fusarium* rot of the base of the stem were reported. Maize smut (*Ustilago zeae*) occurred in September on a fodder crop at Weybridge. Chives (*Allium schoenoprasum*) at Crowborough, Sussex, were attacked by the rust *Puccinia porri* [*R.A.M.*, xiii, p. 558]; a species of *Heterosporium* was also abundant on the dead or moribund leaves and there was a small amount of a *Colletotrichum* agreeing with *C. circinans* [ibid., i, p. 278; xii, p. 672] on the basal parts of the leaves and the neck of the bulb. The *Heterosporium* had much smaller spores than those of *H. allii* var. *cepivorum* previously recorded on onion leaves [ibid., xi, p. 423], the conidia found on chives measuring 25 to 38 by 8 to 12μ. A Bramley's Seedling apple fruit showing the presence of *Sphaeropsis malorum* [*Diplodia mutila*: ibid., xiii, p. 312] was received from storage in Jersey; the fungus is very rarely reported in England.

In June, 1934, the hops attacked the previous year by a severe form of split leaf [ibid., xiii, p. 355] were again affected, the leaves having split and showing an oily mottle and the bines being checked in growth. It was clear that the disease was spreading. A new disease resembling mosaic in many of its symptoms and apparently of the virus group was found on Fuggles hops and is under study.

Foëx (E.). **Quelques maladies qui ont attaqué les cultures pendant une période hivernale douce et humide.** [Some diseases attacking cultivated plants during a mild, damp winter period.]—*C. R. Acad. Agric. Fr.*, xxi, 5, pp. 196–198, 1935.

During the mild, damp spell prevailing in France during the last days of 1934 and the opening week of 1935, early wheat varieties, such as Mentana, were severely attacked by yellow rust (*Puccinia glumarum*) [cf. *R.A.M.*, xiii, p. 81; xiv, p. 77], while a few uredosori of *P. graminis*

were also detected on careful search. *Cercosporella herpotrichoides* and *Ophiobolus graminis* were found to have developed with unprecedented intensity on October-sown wheat [ibid., xiii, p. 568]. Barley showed leaf spots due to *Helminthosporium* (?) *teres* [ibid., xiv, p. 159] and an unidentified *Marssonina* [cf. ibid., vi, p. 721; viii, p. 302]. *Pseudopeziza medicaginis* was prevalent on lucerne. Spinach was heavily damaged in the Versailles region by *Pythium ultimum* [ibid., xiii, p. 5; xiv, p. 259] during November and December.

Pollacci (G.). **Rassegna sull'attività del Laboratorio Crittogamico di Pavia (Osservatorio Fitopatologico per le provincie di Cremona, Parma, Pavia e Piacenza) durante l'anno 1934.** [Report on the activity of the Cryptogamic Laboratory of Pavia (Phytopathological Observatory for the provinces of Cremona, Parma, Pavia, and Piacenza) during the year 1934.]—*Atti Ist. bot. Univ. Pavia*, Ser. IV, vi, pp. 1–18, 1935.

In this report, which is on the same lines as those for previous years [cf. *R.A.M.*, xiii, p. 681], a summary is given of the work carried out in 1934 at the Cryptogamic Laboratory, Pavia, followed by a list (arranged under hosts, and containing a number of human and animal pathogens) of the diseases identified during the year. The season was marked by a very severe outbreak of vine mildew (*Plasmopara viticola*) which, in spite of every effort on the part of the growers, caused enormous damage both to the quantity and the quality of the crop. Repeated analyses of the different sorts of copper sulphate used by the growers demonstrated that the inefficacy of the spray applications was due, not to an inferior quality of the product used, but to persistent rain, which washed the mixture off the leaves before it could exert any fungicidal action.

Plagas del campo. Memoria del Servicio Fitopatologico Agricola. Año 1933. [Field pests. Report of the Phytopathological Agricultural Service for the year 1933.]—*Min. Agric., Direcc. gen. Agric.*, Secc. 3a, 312 pp., 51 figs., 2 diags., 1 graph, 4 maps, 1934.

Following the lines of the previous year's report [*R.A.M.*, xiii, p. 176], brief surveys are given of the activities of the agricultural sections of the provinces and the national service of phytopathological inspection, as well as of the work of the eight Spanish phytopathological stations. An appendix on phytopathological legislation in Spain is included.

Die wichtigsten starken Schäden an Kulturpflanzen im Jahre 1934. [The principal severe damage to cultivated plants in the year 1934.] —*NachrBl. dtsch. PflSchDienst*, xiv, 12, pp. 115–118; xv, 1, pp. 9–10; 2, pp. 15–19; 3, pp. 29–33, 2 graphs, 21 maps, 1934–5.

Notes are given on the prevalence of some well-known diseases and pests affecting cultivated plants in Germany in 1934. Maps are given showing the distribution of several major diseases of cereals, potatoes, beets, vegetables, and fruit trees.

Eighth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1934.—77 pp., 1935.

In the section of this report dealing with plant investigations (pp. 7–16) it is stated that of eighteen wheat varieties from China and Cyprus tested for resistance to the Australian form of flag smut [*Urocystis tritici*] only three showed a resistance comparable with that of the Nabawa variety [*R.A.M.*, x, p. 782]. Further evidence was obtained that *Wojnowicia graminis* is only weakly parasitic on wheat [ibid., xiii, p. 355]; under greenhouse conditions the fungus infected fourteen grasses, of which *Hordeum murinum* was the most severely attacked, being reduced in size by 30 per cent. and dying a week before the controls.

Investigations showed that in the control of tobacco frog-eye (*Cercospora nicotianae*) [ibid., xiii, p. 215] the first essential is to use disease-free seedlings. Seedlings grown from seeds taken from farms where the disease was prevalent in 1932–3 or 1933–4 developed the disease shortly after germinating. Seed sterilization (with 1 in 1,000 silver nitrate) [cf. ibid., xii, pp. 77, 753] was found effective in preventing seed transmission. Bordeaux mixture, copper emulsion, and colloidal copper all controlled the disease in the seed-bed, but variations in the curing methods did not appreciably reduce the barn spot form [ibid., xiii, p. 545].

An *Aphanomyces* causing root rot of peas was isolated from Tasmanian material.

It is estimated that by the time they mature at least 20 per cent. of the pine trees in New South Wales coastal plantations will have had their growth arrested and their commercial value practically destroyed, as a result of the 'needle fusion' disease [ibid., xiii, p. 356]; in some areas over 50 per cent. of the trees are affected, while in Queensland at least 60 per cent. are attacked. *Pinus pinaster* has in no instance shown any symptoms of the disease. Whether needle fusion is infectious or not is uncertain, though the evidence indicates that it may possibly be due to a virus. Eradication experiments in co-operation with the New South Wales Forestry Department are being carried out in two plantations with 17,000 trees.

Henrick (J. O.). **A note on plant diseases.**—*Tasm. J. Agric.*, N.S., vi, 1, pp. 28–29, 1 fig., 1935.

The author gives a few notes on certain crop diseases observed at the end of 1934 in the northern half of Tasmania, among which the following may be mentioned. Clovers were fairly severely attacked by rust (*Uromyces trifolii*) [*R.A.M.*, xi, p. 423]; the Mt. Barker strain of subterranean clover, in particular, suffered greatly, all its aerial organs being destroyed within a week. In some areas market garden peas were ruined by downy mildew (*Peronospora viciae*) [ibid., xiv, p. 340]. There was also a rather unusual outbreak in great severity of powdery mildew (*Erysiphe graminis*) [ibid., xiv, p. 229] on the stems and leaves of wheat at the 'ears peeping' stage.

POLE EVANS (I. B.). **Aiming at better pastures and field crops. Annual Report of the Division of Plant Industry.**—*Fmg. S. Afr.*, ix, 105, pp. 539–548, 568, 1 fig., 1934.

The following items of phytopathological interest occur in this report. No cases of citrus canker [*Pseudomonas citri*] having been observed in the Union of South Africa during the past six years, permission was given in 1934 for planting within the quarantined area 8,918 trees and 40,000 seedlings and for budding 6,150 trees [*R.A.M.*, xiii, p. 425].

Heavy losses (up to 75 per cent. of the crop) were sustained in the eastern Transvaal through a brown rot of tomatoes caused by a species of *Phytophthora*.

Promising results were given by experiments in varietal resistance to watermelon wilt [*Fusarium niveum*: ibid., xiv, p. 224].

Fruit rot of litchi [*Nephelium* litchi] has been found to be associated with three organisms, viz., a yeast responsible for the soft, pinkish type of decay, a *Pestalozzia* causing a white rot, and an unidentified fungus producing a greyish-black decay.

Helicobasidium compactum [ibid., xii, pp. 9, 425] has been definitely implicated as the agent of the disease of *Pinus longifolia* near Louis Trichardt to which reference has already been made [ibid., xiii, p. 425].

The following diseases new to the Union were identified during 1934: delphinium wilt (*Sclerotium rolfsii*) [ibid., xiv, p. 147], fig canker (*Phoma cinerescens*), hydrangea mildew (*Oidium polygoni*) [?*Microsphaera polonica*: ibid., xiii, p. 681; cf. also xiv, p. 146], sooty blotch of mango (*Gloeodes pomigena*), and vine excoriosis (*P. flaccida*) [ibid., xiv, p. 346]. Among the disturbances giving more trouble than usual were downy mildew of cucumbers [*Pseudoperonospora cubensis*: ibid., xi, p. 268], powdery mildew of mangoes [?*Erysiphe cichoracearum*: ibid., xi, p. 625], watermelon anthracnose [*Colletotrichum lagenarium*: ibid., xiv, p. 344], and the lawn grass infections due to *Helminthosporium* sp. (black blotch), *Rhizoctonia* [*Corticium*] *solani* (brown patch), and *R.* sp. (dollar spot) [see below, p. 449].

SMITH (F. E. V.). **Annual Report of the Government Microbiologist, 1933.**—*Rep. Dep. Agric. Jamaica, 1933*, pp. 19–21, 1935.

After referring to the effect on different crops of the adverse weather experienced in Jamaica in 1933, the author states that the loss of banana land in the island from Panama disease (*Fusarium oxysporum cubense*) is rapidly increasing every year, some 2,000 acres being given up in 1933 alone. At this rate the quality as well as the quantity of the export trade will soon be affected, as the better lands, which produce the heavier fruit, are rapidly being abandoned [*R.A.M.*, xiii, p. 79; xiv, p. 378].

MCDONALD (J.). **Annual Report of the Senior Mycologist.**—*Rep. Dep. Agric. Kenya, 1933*, pp. 146–158, 1934.

Investigations by C. A. Thorold into the so-called 'Elgon die-back' of coffee in Kenya showed it to be non-parasitic and associated with lack of shade.

Twenty-one hybrid wheat varieties developed at the Njoro Plant Breeding Station were resistant to all four physiologic forms of stem

[black] rust (*Puccinia graminis*) found in Kenya [*R.A.M.*, xiii, pp. 222, 361]. Prolonged attempts to germinate locally-collected teleutospores of this rust by alternate freezing and thawing, and drying and wetting were unsuccessful and there is as yet no evidence that the barberry plays any part in the perpetuation of black rust in the colony. It is not yet known whether more than one physiologic form of *P. glumarum* is present in Kenya, but a collection of differential wheat varieties has been obtained from Gassner in Germany to test this point [ibid., xiii, p. 757]. Where wheat fields severely affected by *Ophiobolus graminis* [ibid., xiii, p. 217] were planted with oats, improvement occurred when wheat was again grown the following year. Symptoms closely resembling those of basal glume rot were observed on wheat ears, but though bacteria were abundantly present in the affected tissues none agreed completely with the description of *Bacterium atrofaciens* [ibid., xii, p. 430].

C. A. Thorold found the *Gibberella* stage of *Fusarium moniliforme* on maize stalks, spores from which gave rise in culture to the conidial stage; as this formed heads, not chains, the fungus is probably *F. moniliforme* var. *subglutinans* [*G. fujikuroi* var. *subglutinans*: see next page].

Mosaic appeared in some eighty acres of sugar-cane at Chemelil, Nyanza Province, newly planted with Ba 11403, Ba 11569, and B.H. 10 (12) after the eradication of all infected and uninfected Kampala canes [loc. cit.].

The new records made include oat crown rust (*P. coronata*) [*P. lolii*] and rye leaf rust (*P. dispersa*) [*P. secalina*].

Hopkins (J. C. F.). **Southern Rhodesia : new records of fungus diseases for the year ending May 31st, 1934.**—*Int. Bull. Pl. Prot.*, ix, 2, pp. 30–32, 1935.

During the period from April to June, 1934, red locusts (*Nomadacris septemfasciata* Serv.) were extensively attacked by *Empusa grylli* [*R.A.M.*, xiv, p. 234].

Orange-rotting fungi observed during the administrative year included *Phytophthora citrophthora*, *Fusarium solani* [ibid., xiii, p. 631], *Trichoderma lignorum* [ibid., xiv, p. 163], *Diaporthe citri* [ibid., xiv, p. 161], *F. diversisporum* affin., *F. moniliforme* var. *erumpens* Wr. & Rg. affin., *F. oxysporum*, *F. lateritium* near var. *majus*, and *F. orthoceras*.

Rhizoctonia [*Corticium*] *solani* was responsible for black root and hard fruit rot of strawberries [ibid., xii, p. 489; xiii, p. 454].

Deighton (F. C.). **Mycological work.**—*Rep. Dep. Agric. S. Leone, 1933*, pp. 14–20, 1935.

Early in 1933 tip and stem end rots of Cavendish banana [*Musa cavendishii*] fruit associated with *Gloeosporium musarum* were recorded at Njala, Sierra Leone; inoculation tests in the laboratory on half-grown and ripe fruits with *Helminthosporium torulosum* and *Stachylidium theobromae* (previously reported as a *Verticillium*) [*R.A.M.*, xii, p. 552], which are also associated with tip rotting, gave negative results but *G. musarum* readily infected the ripe fruit. A leaf speckle has been observed on all varieties of bananas and plantains at various places. The upper surfaces showed minute, very dark brown spots aggregated into patches of different sizes and shapes, but generally about an inch

across. Round the patches a yellow colour sometimes developed on the older leaves. On the lower leaf surface the spots were paler and more diffuse. The condition was associated with a *Rhinotrichum*, the speckles being formed by blocks of palisade cells killed by branch hyphae which penetrated the stomata on the under surface.

From two years' observations in the experimental cassava plot the greatest number of mosaic infections appear to occur during the rainy period (June to October); the Mayughe, Two Cent, Kono, and Cotton-tree varieties remained unaffected, though all were attacked in other parts of the country [cf. ibid., xii, p. 553]. Cases of apparent recovery were observed and experiments indicated that the disease is not seed-borne.

No scab [*Sporotrichum citri*: ibid., xii, p. 553] has yet been seen in Sierra Leone on native sour orange trees [*Citrus aurantium* var. *bigaradia*] except for a few small lesions on one tree. It seems reasonably certain that the disease was first introduced on grafted plants (grapefruit) from Florida in 1916. The fungus most commonly causing rotting of stored citrus from October to December was *Penicillium digitatum*, *Diplodia* [*?natalensis*] being rather less frequent, while *Colletotrichum gloeosporioides* was seldom found; *Oospora citri-aurantii* [loc. cit.] caused rotting of the pulp and rind of split fruit. A *Fusarium* rot provisionally attributed to *F. moniliforme* var. *majus* [ibid., xiii, p. 128] and var. *subglutinans* [*Gibberella fujikuroi* var. *subglutinans*: ibid., xiii, 300] was observed on wounded fruit.

The *Botrytis* associated with blossom-drop of avocado and *Jatropha* [*podagrica*: ibid., xii, p. 553] was identified as *B. cinerea*: it was again troublesome on avocado during the dry season.

Other records include *Myrothecium* sp. (probably *M. roridum* Tode) causing a leaf spot of *Impatiens holstii* hybrids; an *Oidium* (presumably *Erysiphe cichoracearum*) on okra [*Hibiscus esculentus*]; *Sclerotium coffeicolum* on *Jasminum pubescens* leaves, causing defoliation; the sclerotial stage of *Macrophomina phaseoli* on rotted papaw roots; *Fomes yucatanensis* [ibid., ii, p. 142; iii, p. 444] parasitic on *Cathormion altissimum*; *Hypocrella reineckiana* [ibid., xii, p. 553] on Lecaniid scales on *Ficus ovata*; the *Aschersonia* stage of *H. sphaeroidea* Syd. (*H. olivacea* Petch) on Lecaniid scales on *Phoenix dactylifera*; and *A. crenulata* on an Aleurodid on *Phyllanthus discoides*.

Forty-fourth Annual Report of the Alabama Agricultural Experiment Station for the fiscal year ending June 30, 1933.—32 pp., [? 1933. Received March, 1935.]

The following are some of the items of phytopathological interest in this report. J. L. Seal's continued studies on the disease of winter peas caused by *Mycosphaerella pinodes* and on those of winter peas and vetches [*Vicia* spp.] due to species of *Ascochyta* [*R.A.M.*, xi, p. 345; cf. also xiii, p. 611] showed that the first-named fungus is more generally responsible for damage than the others, which are, however, of common occurrence in field plantings of winter legumes. Failure of inoculation [with the nitrogen-fixing nodule bacteria] has been found to be an important factor in predisposing the crops to infection by these pathogens. The species of *Ascochyta* concerned in these diseases are stated to be

more commonly perpetuated in and on the seed than *M. pinodes*. All the organisms may subsist from year to year in the imperfect stage on plant refuse, while *M. pinodes* may also be found forming asci on débris during the late spring and summer. Storage of legume seeds over a four-year period results in the gradual disappearance of the fungi, but at the same time germination is so much reduced as to render this measure impracticable. Crop rotation, the use of healthy seed, and seed disinfection are advocated for the control of these diseases.

Two parasites of the pecan weevil (*C.* [*Balaninus*] *caryae*), *Metarrhizum anisopliae* [ibid., xiii, p. 94], and *Sporotrichum* [*Beauveria*] *bassiana* [ibid., xiv, p. 361] were successfully reared in large quantities on maize meal media by H. S. Swingle and J. L. Seal. Three applications of spores to the soil round pecans resulted in the apparent establishment of infection without, however, completely exterminating the larvae.

Chabrolin (C.). **Notes phytopathologiques tunisiennes.**—[Phytopathological notes from Tunis.]—*Bull. Soc. Hist. nat. Afr. N.*, xxvi, 2, pp. 26–41, 4 pl., 5 figs., 1935.

Urophlyctis leproides [*R.A.M.*, xii, p. 537] is commonly present on beets at the French Colonial Agricultural School, Tunis, but causes very little damage. Its life-history appears closely to resemble that of *U. alfalfae* [ibid., xii, p. 177]. In addition to tumours on the crown of the beets, it also produces galls, often in large numbers, on the blade and main veins of the leaves. The fungus is found on wild *Beta vulgaris* remote from cultivated areas, on which it is apparently indigenous in Tunis.

Notes are also given on barley leaf blotch (*Marssonia graminicola*) [*Rhynchosporium secalis*: ibid., xiv, p. 15] and leaf spot (*Helminthosporium teres*) [ibid., xiv, p. 299], wheat brown neck [ibid., viii, p. 637], broad bean (*Vicia faba*) mosaic [ibid., xiv, p. 4], date palm (*Phoenix dactylifera*) heart rot (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [ibid., xii, p. 302; xiii, p. 92], *Diplodia phoenicum* [ibid., xi, p. 571] on *P. canariensis*, *Septoria pistacina* on pistachio nut (*Pistacia vera*) leaves [ibid., vi, p. 627; viii, p. 339], *Gloeosporium fructigenum* [*Glomerella cingulata*] on almond fruits (stated to be the first record on green almonds), and *Polystigma ochraceum* on almond leaves [ibid., vi, p. 81].

Infection of date palms by *C. paradoxa*, a well-known trouble in Tunis, is followed by arrested development; the fully grown leaves persist, but no new ones are formed, the heart tissues being killed. If the terminal bud rots completely, the tree dies; if only partially, it grows for a time horizontally and then resumes its perpendicular habit.

On pistachio leaves *S. pistacina* produces dark brown, round or angular spots, 0·5 to 1 mm. in diameter, visible on both sides of the leaf, and sometimes covering at least half its surface; a whitish, translucent cirrhus of stylospores emerges from a pycnidium in the centre of each spot. The growth of affected trees is often arrested. Trees that showed severe infection early in May became completely defoliated by the beginning of August; the leaves lost colour, turned yellow, and finally fell, leaving the stalk adhering to the branch. Later, new leaves appeared on some of the trees. In southern Tunis the disease is endemic, and occasionally dangerous.

Magrou (J.). **Réactions d'immunité des plantes vis-à-vis du Bacterium tumefaciens.** [Immunity reactions in plants in respect of *Bacterium tumefaciens*.]—*C. R. Acad. Sci., Paris*, cc, 3, pp. 257–259, 1935.

Agglutination was produced in aqueous suspensions of *Bacterium tumefaciens* in 9 cases out of 11 by the juice of a tumour on *Pelargonium zonale* at dilutions up to 1 in 1,000, and in 4 out of 6 by that of diseased *Chrysanthemum frutescens* juice (up to 1 in 10,000) [*R.A.M.*, xiii, pp. 151, 152]. Agglutination was most intense at the maximum concentrations, contrary to what was found in a test with the juice of healthy plants, in which the climax was reached in 11 out of 13 cases at a certain optimum and there was no agglutination at the maximum concentrations. In 3 cases out of 4 the juice of a healthy portion of a gall-bearing branch agglutinated the bacterial suspensions similarly to that from the infected areas. The agglutinating property was lost after 15 minutes' heating at 100° C. but maintained after half-an-hour at 80°.

Phytopathogenic bacteria other than *Bact. tumefaciens* were not agglutinated by the juices from diseased or healthy tissues of the experimental plants, while the crown gall agent from the above-mentioned tumours failed to respond by agglutination to the juice from crown galls on beetroot.

Precipitation immediately followed the introduction of juice from *C. frutescens* tumours into extracts, not only of *Bact. tumefaciens*, but also of *Bact. malvacearum*, *Bact. flaccumfaciens*, *Bact. mori*, and *Bacillus carotovorus*. The character for precipitation was found to be restricted to the diseased tissues and to the healthy portions of gall-bearing branches.

Stahel (G.). **De krullotenziekte in Brazilië.** [The witches' broom disease in Brazil.]—*Ind. Mercuur*, lviii, 6, p. 71, 1935.

The witches' broom disease of cacao [*Marasmius perniciosus*] is stated to have been first detected forty years ago in the Saramacca district of Surinam [*R.A.M.*, xiv, p. 224], whence it spread within the next five years to all the chief plantations. Passing westward, it reached Demerara in 1906, but not until 1928 was it first observed on the east coast of Trinidad [ibid., viii, p. 160]. It is probable that the cacao plantations of the Orinoco delta, half-way between Demerara and Trinidad, and those of Carupano, opposite the latter on the mainland, were already infected at this period, but accurate information from these regions is wanting. The destructive outbreak in Ecuador, first reported in 1922 [ibid., xiii, p. 359], is due to a strain of the fungus possibly originating in the upper reaches of the Amazon and differing markedly from those in Surinam and Trinidad; the writer believes that this strain must have been conveyed by spores over the Andes from the wild cacao in that region. In 1920 and 1926 two cacao groves extensively infected by *M. perniciosus* were found well in the interior of Surinam, one in the upper Coppename region and the other along the upper Kutari some 20 km. from the Brazilian frontier [ibid., xiv, p. 155]. Cacao branches sent to the writer by J. R. Weir from the river Tapajoz, a tributary of the Amazon, bore witches' brooms up to 40 cm. in length, and the disease is reported to be prevalent throughout the Amazon valley. *M. perni-*

ciosus is now definitely known to be present in all the principal cacao-growing regions of South America apart from Venezuela (the eastern part of which is probably infected) and Bahia.

LATHBURY (R. J.). **Report of the Acting Senior Plant Breeder.**—*Rep. Dep. Agric. Kenya, 1933*, pp. 182–200, 1934.

Seedling inoculation tests carried out in Kenya showed that the South American Sabanero wheat variety was resistant to all four local physiologic forms of stem [black] rust [*Puccinia graminis tritici*: see above, p. 427]. It grew well, especially under poor, dry conditions, and owing to its resistance to black rust it is recommended for all areas in Kenya except those at the highest altitudes, where it is too susceptible to yellow rust [*P. glumarum*].

The advance previously reported [*R.A.M.*, xiii, p. 222] in the production of rust-resistant varieties at Njoro was maintained, a number of new strains being issued to farmers. An artificial epidemic of all the four forms of black rust [ibid., xiv, p. 226] enabled the hybrid wheat varieties grown at Njoro to undergo a very severe test, in which a number of strains proved to be highly resistant.

The wheat hybrids produced at the Scott Agricultural Laboratories all being susceptible to the recently discovered physiologic form K4 of black rust, a fresh series of nineteen crosses was made, in which Nos. K 2, R 5 (L 2), and UX 9 MIA 9 D, Sabanero, and Reliance were used as the resistant parents. Form K4 was not confined to the lower altitudes, as was at first hoped. Little difficulty was experienced in the breeding work in transmitting resistance to forms K1, K3, and K4, but the transmission of resistance to form K2, is a more complex problem.

Maize breeding work at Trans Nzoia is chiefly directed to producing types resistant to *Helminthosporium turcicum* and *Fusarium* rots [ibid., xii, p. 222]. In the 1933 experiments the plants were awarded marks from 0 (complete susceptibility) to 10 (complete resistance) for their characters in relation to resistance to *H. turcicum*, maize rust (*P. maydis*), and *Fusarium* spp. As in 1932, high marks were obtained for resistance to the first two by some lines, but only a few were very resistant to the *Fusarium* rots.

VANDERWALLE (R.). **Contribution à l'étude de la désinfection des céréales par l'eau chaude.** [A contribution to the study of cereal hot-water treatment.]—*Bull. Inst. agron. Gembloux*, iv, 1, pp. 3–21, 3 figs., 11 graphs, 1935. [Flemish, German, and English summaries.]

Investigations into the effect of hot-water treatments for the disinfection of cereal seed-grain [cf. *R.A.M.*, xiii, p. 750] showed that no appreciable injury to wheat, oats, barley, or rye was caused at temperatures under 50° C. except after long exposure, whereas even short exposures to temperatures above this were injurious. Short exposures at high temperatures did not give comparable results with long exposures at low ones. With the wheat varieties tested, the darker the grain the more resistant it was to the injurious effects of heating. With all the cereals treated a sigmoid graph was obtained for the effect of the exposures on germinative power at a certain temperature. Injury

increased with the age of the seed and the reduction of germinative ability.

JOHNSTON (C. O.) & MILLER (E. C.). **Relation of leaf-rust infection to yield, growth, and water economy of two varieties of Wheat.**— *J. agric. Res.*, xlix, 11, pp. 955–981, 7 figs., 1934.

This is a full, tabulated account of the authors' studies from 1931 to 1933 on the effect of intensity and duration of infection with leaf [brown] rust (*Puccinia triticina*) on the yield, plant characters, and water economy of two spring wheats, namely, Pusa No. 4 (susceptible) and Warden (resistant), an abstract from which has already been noticed [*R.A.M.*, xii, p. 427]. In the susceptible variety, rust reduced the yield in grain on the average by 42·4 to 93·8 per cent. (by weight) of that of the controls, the reduction increasing with the duration of the infection period, and being caused in the first place by the reduction of the number of grains formed in the ear and only secondarily by a reduction in the weight per grain [cf. ibid., xiii, p. 755]. While the yield of straw was not so heavily affected by the rust, it was reduced by more than one-third in the plants that were rusted from the seedling stage to maturity. Heavy infection resulted in a rapid and severe deterioration of the root system, independent of the time of infection, and characterized by discoloration, decrease in the number of fibrous roots, and marked loss in weight. Plants heavily rusted for long periods produced numerous new tillers at about the time when the grain of the primary culms began to mature. Infection with the rust also considerably retarded heading and prolonged the fruiting period.

In the resistant variety the rust resulted in a maximum reduction in yield of grain of 15·2 per cent. when the leaves were abundantly flecked, and only slightly affected all the other characters of the plants.

HANNA (W. F.). **The physiology of the fungi causing bunt of Wheat.**— *Proc. fifth Pacif. sci. Congr.*, pp. 3195–3204, 3 figs., 1 graph, [1934.]

A study of the conjugation of the sporidia of *Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetens*] showed that on a medium of P_H6 approximately the same percentage (50) of pairs of sporidia belonging to the same spore conjugated at 10°, 18°, and 20° C. When sporidia from two different spores were paired on a medium of P_H6, approximately 50 per cent. of the pairs conjugated. It is therefore assumed that the sporidia produced by the spores taken from the single bunt ball used were of two kinds occurring in approximately equal numbers.

In investigations into heterothallism in *T. caries* and *T. foetens* the sporidia from spores of the former from a single bunt ball were cultured separately before conjugation occurred; other cultures were similarly made from single secondary conidia of both organisms. In one experiment pure cultures were obtained in this way from all the fourteen sporidia of one chlamydospore. Kota and Reward wheat seedlings were inoculated by inserting mycelium from a single culture or pairs of cultures into an incision made near the base of the plumule; after inoculation they were kept for about 12 days at 10°C. and then transferred to pots in the greenhouse. The plants inoculated with the mycelium of a a single culture of either fungus, whether the mycelium was derived from

a single sporidium or a single secondary conidium showed no infection, whereas those inoculated with certain pairs of mycelia produced bunted heads. The successful inoculations were made with pairs of mycelia from single sporidia, with pairs from single secondary conidia, or with mycelium from a sporidium and from a secondary conidium.

When crosses were made between *T. caries* and *T. foetens* by inoculating Kota and Reward seedlings with pairs of mycelia, the hybrid bunt balls were like those of the *T. foetens* parent, and the spores were smooth and contained trimethylamine [*R.A.M.*, xii, p. 277]. In the author's inoculation experiments definite proof has so far been obtained of the existence of only two sexual groups for the mycelia of *T. caries* and *T. foetens* [ibid., xi, p. 440].

The secondary conidia of both species were found to be uninucleate, as were those of *Entyloma menispermi*, *E. lobeliae*, and *E. linariae*; inoculation experiments and cytological observations when taken in conjunction appeared to show conclusively that the secondary conidia of *T. caries* and *T. foetens* are haploid.

Fellows (H.) & Ficke (C. H.). **Effects on Wheat plants of Ophiobolus graminis at different levels in the soil.**—*J. agric. Res.*, xlix, 10, pp. 871–880, 5 figs., 1934.

The results of experiments from 1925 to 1928 at Manhattan, Kansas, showed that *Ophiobolus graminis* [*R.A.M.*, xiv, pp. 157, 229] occurred throughout the upper layers and down to a depth of at least 15 in., in naturally infected soils. Artificial soil inoculations in pots and in the field indicated that serious injury to wheat (Kanred) plants only resulted when the inoculum was placed at a depth of 3 in. or less below the seed. The fungus reached the crowns either through the primary roots and sub-crown internodes or through the secondary roots, or both, severe infection of the hosts resulting from abundant invasion of the crowns, and usually terminating in the death of the plants. When only few roots were attacked, additional secondary roots were formed, and the plants survived and yielded fairly well. Various intergradations between these two extreme cases were observed. There was also evidence that *O. graminis* grows in the roots farther upwards than downwards.

Meyer-Hermann (K.). **Beobachtungen über das Vergilben der Wintergerstensaat.** [Observations on the yellowing of the winter sown Barley.]—*Dtsch. landw. Pr.*, lxii, 3, p. 27, 5 figs., 1935.

In connexion with a brief description of various forms of yellowing in winter barley in Germany, the writer states that good control of mildew (*Erysiphe graminis*) [*R.A.M.*, xiv, p. 26], one of the causes of the trouble, was incidentally obtained in a recent test with unoiled calcium cyanamide, applied primarily against bent grass [*Agrostis alba*], at the rate of 1 doppelzentner per hect. 'Pearl' calcium cyanamide at the rate of 2 doppelzentner per hect. also proved beneficial.

Graham (T. W.). **Nuclear phenomena in Helminthosporium gramineum.**—*Phytopathology*, xxv, 2, pp. 284–286, 2 figs., 1935.

Cytological studies of various growth stages of stained and fixed material of *Helminthosporium gramineum* [*R.A.M.*, xiv, p. 353], using

both mycelium from artificial culture and preparations from infected [barley] seed coats, endosperms, diseased seedlings before emergence of the young leaves from the coleoptile, and mature diseased leaves, showed the hyphal cells to be almost uniformly multinucleate, as also were the macro- and microconidia (1 to 13, usually 4 to 7 nuclei), and germ-tubes. Several nuclei were found to be already present in very young spores, so that the organism may even at this stage be truly heterocaryotic. Fusion of conidia, germ-tubes, and hyphal cells is of frequent occurrence, the nuclei apparently passing through the fusion tubes from cell to cell. Strong evidence is stated to be forthcoming that variation and physiologic specialization in *H. gramineum* may be at least partially explained by heterocaryosis.

Titus (H. W.) & Godfrey (A. B.). **Comparison of scabbed Barley, normal Barley, and Yellow Corn in diets for laying Chickens.**—*Tech. Bull. U.S. Dep. Agric.* 435, 9 pp., 3 graphs, 1934. [Received May, 1935.]

Comparative tests of the relative value of normal barley, barley affected with scab [*Gibberella saubinetii*], and yellow maize in diets for laying chickens showed that while the maize diets were the most efficient, barley with any degree of scab from moderate to very severe infection gave the same results as normal barley as regards maintenance of live weight and amount and economy of egg-production [cf. *R.A.M.*, xiv, p. 231].

Smith (D. C.). **Correlated inheritance in Oats of reaction to diseases and other characters.**—*Tech. Bull. Minn. agric. Exp. Sta.* 102, 38 pp., 11 figs., 1934. [Received May, 1935.]

Studies on the inheritance of reaction to *Puccinia graminis* in the cross of Gopher (moderately resistant to forms 1, 2, 5, and 9 and susceptible to forms 3, 4, 6, and 7) × Rainbow (resistant to all these forms) oats in Minnesota [cf. *R.A.M.*, xiii, p. 363] indicated that resistance and susceptibility to physiologic forms 1, 2, 3, 5, and 7 depended on a single, similar factor pair. Resistance to these forms was dominant in the progeny. The results obtained for segregation to forms 8 and 9 were inconclusive as regards the manner of inheritance, though the data indicated that the same factor pair influenced the reaction. No families resistant to forms 4 or 6 were obtained. These, together with the results of previous workers, indicate that a series of multiple allelomorphs controlling stem-rust reaction occur in oats. Resistance was inherited independently of lemma colour, length, strength or presence of awn, basal hairs, blast [ibid., xi, p. 363], culm diameter, or breaking strength of the straw. Seedling and adult plant reactions to forms 1, 2, 3, 5, and 7 agreed completely. Other factors than culm diameter and breaking strength were found to be important in resistance to lodging. Blast percentage in the F_3 families showed a significant positive correlation with lateness of heading.

Resistance to crown rust (*P. coronata*) [*P. lolii*: see next abstract] in crosses of Victoria with Double Cross II–22–220, Minrus, and Anthony was dominant or intermediate in the seedling stage and intermediate in adult plants; in some crosses resistance was associated with late maturity.

Murphy (H. C.). **Physiologic specialization in Puccinia coronata avenae.**—*Tech. Bull. U.S. Dep. Agric.* 433, 48 pp., 1935.

This is a detailed and fully tabulated account of the author's continued investigations of specialization in *Puccinia coronata avenae* [*P. lolii*: *R.A.M.*, xi, p. 498; xiii, p. 434]. Using 11 [listed] oat varieties as standard differential hosts he determined the occurrence in North America from 1927 to 1932 of at least 33 physiologic forms of the rust. The reactions of these forms (to which standard numbers from 1 to 33 are assigned) on the differential varieties are briefly described, and a key for their identification is given. The forms differed not only in pathogenicity, but also in rapidity of the development of their teleuto stage, and some of them could be subdivided by the latter character. 'Restricted' (pathogenic to only a few of the differential varieties) forms tended to produce teleutospores more rapidly than the 'aggressive' (more widely pathogenic) forms, and usually teleutosori appeared on resistant varieties a few days earlier than on susceptible ones.

The reaction of the differential varieties, and of Victoria, Bond, and Markton, to form 1 was not greatly affected by the temperature (55°, 65°, 75°, or 85° F.) at which the plants were grown, but the effect of temperature on their reaction to form 7 was striking, this form being hardly distinguishable from form 1 at 85°; certain varieties were resistant at low and susceptible at high temperatures, and at intermediate temperatures they developed a mesothetic (X) [ibid., ii, p. 159] reaction. Forms 1, 3, and 7 were found each year, forms 1 and 7 being the most widely distributed and common. Observations indicated that these two forms, as well as some of the less important ones, overwinter on autumn-sown and volunteer oats in the winter oat regions, while other forms are apparently entirely dependent on the alternate host (*Rhamnus* spp.) for their perpetuation from year to year.

In tests of the seedling reaction of 266 [listed] oat varieties to forms 1, 3, 7, 16, 17, and 18, and of the adult reaction of these varieties to natural epidemics of crown rust at various localities in the central and southern parts of the United States, form 1 was the most aggressive, only 4 varieties, namely, Bond, Glabrota, Victoria (C.I. 2401), and Victoria (Scasso C.I. 2764), being resistant to it in the seedling stage. Bond and the two Victoria varieties alone proved to be resistant to all the 6 forms tested. There also was evidence that in adult plants the younger tissues appeared to be most susceptible and the older tissues most resistant.

Fourteen of the 33 physiologic forms were collected from naturally or artificially inoculated *Rhamnus* spp., including form 2 which is evidently heterozygous, since five additional forms were isolated from aecidia which developed when *Rhamnus* was inoculated with it. This would suggest that new forms may originate by hybridization and segregation on the aecidial host. Certain of the species of *Rhamnus* showed a tendency to harbour specific forms of the rust.

Of the 70 species of Gramineae which were tested, only *Achyrodes aureum* [*Lamarkia aurea*], *Anthoxanthum odoratum*, *Dactylis glomerata*, *Festuca octoflora*, *Phleum pratense*, *Poa annua*, and 14 species of *Avena* developed uredosori when inoculated with one or more of the six physiologic forms used.

Hubbard (V. C.) & Stanton (T. R.). **Influence of smut infection on plant vigor and other characters in smut-resistant Oat varieties.**—*J. agric. Res.*, xlix, 10, pp. 903–908, 1934.

A brief account is given of experiments from 1930 to 1932, inclusive, at Mandan, North Dakota, to test the effect of infection with covered smut (*Ustilago levis*) [*U. kolleri*] on the plant vigour and yield of smut-resistant oat varieties (Black Mesdag, Markton, and Navarro), as compared to that in the susceptible Victory variety [*R.A.M.*, xiii, p. 761]. The results showed that the resistant and susceptible varieties grown from dehulled inoculated seeds [ibid., x, p. 178] were adversely affected in their yield per row, the number of plants, panicles, and culms per row, and height, even though no sporulation of the fungus occurred on the resistant oats. There was some indication that the reduction in yield may have been due chiefly to a reduced number of plants in the inoculated rows, and to the presence of the latent infection. Smut infection tends to delay the first heading of both resistant and susceptible varieties.

The fact that in early and medium sowings the average yield was greater than that of late sowing, and that the average yield of the non-inoculated rows was in every case greater than that of the inoculated would suggest that the latent infection reached its greatest development in the late sowings. The rate of plant mortality increased progressively with the later date of sowing.

Rădulescu (E.). **Untersuchungen über die physiologische Spezialisierung des Haferflugbrandes (Ustilago avenae [Pers.] Jens.).** [Studies on physiological specialization in loose smut of Oats (*Ustilago avenae* [Pers.] Jens.).]—*Pflanzenbau*, xi, 8, pp. 295–300, 1935.

Thirteen collections of loose smut of oats (*Ustilago avenae*) from various parts of Rumania were tested for their pathogenicity towards eight standard varieties, of which Columbus, Kelsall's (Australian), and Pflugs and v. Lochows Yellow proved especially useful in separating physiologic forms of the fungus [*R.A.M.*, xiii, p. 231]. The collections were found to comprise four physiologic forms of which (1) is the least virulent, causing appreciable infection only on Fulghum and Laza; (2) attacks Pflugs Yellow, Laza, and Fulghum with fair to considerable severity, while v. Lochows, Columbus, and Kelsall's are relatively resistant; (3) causes heavy damage to Kelsall's, Pflugs, and Fulghum, Laza being moderately susceptible, and Columbus immune; while (4), the most widespread and virulent of the forms, produced a fair to intense degree of infection on all the test varieties except Black Mesdag and Red Rustproof, which were also immune from the three foregoing.

Johnson (I. J.) & Christensen (J. J.). **Relation between number, size, and location of smut infections to reduction in yield of Corn.**—*Phytopathology*, xxv, 2, pp. 223–233, 1935.

A tabulated account is given of the writers' studies in 1933–4, involving over 1,800 paired comparisons between diseased and healthy plants, on the correlation between the number, size, and position of maize smut (*Ustilago zeae*) infections and reduction of yield [*R.A.M.*, xiv, p. 354].

Both single and multiple galls were about twice as destructive on the main stalk and neck above the ear as those of similar size and number below the ear, usually on shoots or suckers. Other things being equal the losses from multiple galls were nearly directly proportional to the number of the galls on the plant, except that two large galls give almost 100 per cent. loss. Large galls above the ear habitually, and medium-sized single or multiple ones in the same site frequently, caused barrenness of the stalks. During 1932–3 some 0·7 per cent. of smutted plants in all the varieties and crosses grown at University Farm, St. Paul, Minnesota, were prematurely killed by the disease. Smut galls on the tip of the ear caused a smaller loss than those of similar dimensions but more uniform distribution over the ear. Heavy losses were caused by medium-sized and large smut galls on the tassels. Ears from smutted plants tended to produce less lustrous kernels than those from healthy ones, and were further more liable to contract ear rots [*Diplodia zeae*, *Gibberella moniliformis*, *G. saubinetii*, and other fungi: ibid., xiv, p. 232 *et passim*].

Stevens (N. E.) & Wood (Jessie I.). **Losses from Corn ear rots in the United States.**—*Phytopathology*, xxv, 2, pp. 281–283, 1 graph, 1935.

Attention is drawn to the close correspondence between two curves representing estimates of the losses from maize ear rots [*Diplodia zeae*, *Gibberella moniliformis*, *G. saubinetii*, and other fungi: see preceding abstract] between 1922 and 1933, one based exclusively on field observations and the other on inspections at terminal markets [cf. *R.A.M.*, xiii, p. 316]. Both show a low point in 1924, followed in 1926 by the heaviest losses of the period, and relatively much smaller damage in the last four years with another drop in 1931. The most marked disparity between the curves appears in 1928, when the field estimate was 25 per cent. and under 5 per cent. loss was actually registered at the official inspections.

Voorhees (R. K.). **Histological studies of a seedling disease of Corn caused by Gibberella moniliformis.**—*J. agric. Res.*, xlix, 11, pp. 1009–1015, 10 pl., 1934.

Continuing his investigations of the disease of maize in Florida caused by *Gibberella moniliformis* [*R.A.M.*, xii, p. 564], the author states that on maize seedlings artificially inoculated in the greenhouse the symptoms are a yellowing of the leaves, retardation in growth, dark brown lesions on the mesocotyls and roots, and in severe cases, a more or less complete drying of the leaves and death of the seedling. The fungus was shown to enter the plumule at its emergence from the coleoptile, the mesocotyl either by direct penetration of the epidermis or through ruptures in the cortex caused by the emergence of adventitious roots, and directly through the coleoptile. The first symptoms of infection in the germinating grain usually appear at the distal end of the coleorhiza and primary radicle, the latter being usually entered through ruptures in the cortex where lateral roots emerge. The cotyledonary plate region may be invaded through the opening produced by the stem bud breaking through the pericarp or by emergence of the coleorhiza, the fungus in

either case advancing into the scutellum and endosperm. There was evidence that the endodermis surrounding the stele in the mesocotyl and primary radicle acts as a barrier to the penetration of the hyphae, its efficacy depending on the degree of suberization.

ALLEN (RUTH F.). **A cytological study of heterothallism in Puccinia sorghi.**—*J. agric. Res.*, xlix, 12, pp. 1047–1068, 7 pl., 2 figs., 1934.

This is a full report of the author's cytological studies of heterothallism in *Puccinia sorghi* [*P. maydis*], an abstract from which has already been noticed [*R.A.M.*, xiii, p. 226]. In artificial inoculations on *Oxalis corniculata* var. *atropurpurea* the sporidial germ-tube enters the leaf through an epidermal cell; the resulting haploid mycelium produces numerous spermogonia on both leaf surfaces, and very small, short-lived, haploid aecidia are formed in abundance near the lower epidermis but deteriorate without forming spores. Stomatal hyphae are produced, chiefly in close proximity to spermogonia and aecidia. Fertile aecidia are only produced after fertilization. The spermogonia remain active for a considerable period, producing spermatia and replacing old paraphyses by new ones. Both the small haploid aecidia and the stomatal hyphae are short-lived, but new ones keep forming. Fertilization is brought about by anastomoses between two mycelia in the leaf and has also been effected by transfer of spermatia of one sex to an infection of opposite sex, a process which can happen in several ways in nature. Fertilization can take place in infections ten days old or at any time afterwards so long as the mycelium remains alive, and is equally effective whether the spermatia reach the upper or the lower surface of the infection. Twenty-four hours after the entrance of the spermatia into the haploid mycelium [loc. cit.], 60 per cent. of the mycelial cells contain more than one nucleus, this rapid diploidization being achieved, in the main, by rapid divisions and migrations of the introduced nuclei. Fertile aecidia open six days after spermatization, and start liberating spores.

RODENHISER (H. A.). **Studies on the possible origin of physiologic forms of Sphacelotheca sorghi and S. cruenta.**—*J. agric. Res.*, xlix, 12, pp. 1069–1086, 1 col. pl., 6 fig., 1 diag., 1 graph, 1934.

Continuing his studies of the problem of hybridization in *Sphacelotheca sorghi* and *S. cruenta* [*R.A.M.*, xii, p. 89] the author gives details of experiments in which he paired in all possible combinations single sporidial lines isolated from promycelia of chlamydospores of physiologic forms 1, 2, and 3 of *S. sorghi* [ibid., xi, p. 448], form 1 of *S. cruenta* [ibid., xiii, p. 227], and from F_1 intra- and interspecific hybrids of the two smuts. Fusions between the paired uninucleate sporidia occurred readily in every case, giving rise to diploid hyphae which were shown by their subsequent behaviour when inoculated into the host to contain hereditary factors of the two parental lines (e.g., factors governing the sex of sporidia, the general morphology of the smut sori, the colour of the peridia, and the degree to which host plants may be stunted, all of which were inherited independently of each other). When tested on Reed kafir sorghum (which is susceptible to all known collections of the two smuts) the intraspecific hybrids were more and the interspecific

hybrids less virulent than the parent lines; on the varieties susceptible to one parent and resistant to the other, both intra- and interspecific smut hybrids were intermediate in virulence. These results appear to support the suggestion advanced by Tisdale, Melchers, and Clemmer that their Milo and Feterita sorghum smut strains may be hybrids of *S. sorghi* and *S. cruenta* [ibid., vi, p. 664].

While nothing is yet known concerning the chromosomes in *S. sorghi* and *S. cruenta* and comparatively little of their genetics, the fact that their sporidia readily fuse together in culture may possibly be an indication of their close taxonomic relationship. On the other hand, the fact that the majority of promycelia from F_1 chlamydospores obtained from the fusion of the second sporidium of form 1 of *S. sorghi* with the corresponding sporidium of *S. cruenta*, produced, instead of sporidia, peg-like structures which failed to develop either sporidia or hyphal threads, is considered to indicate genetic sterility and, consequently, supports the view that *S. sorghi* and *S. cruenta* are distinct species.

Isenbeck (K.). **Untersuchungen über die Physiologie von Sphacelotheca sorghi, den gedeckten Körnerbrand von Sorghum.** [Investigations on the physiology of *Sphacelotheca sorghi*, the covered grain smut of Sorghum.]—*Phytopath. Z.*, viii, 2, pp. 165–182, 5 figs., 1935.

A tabulated account is given of the writer's studies at University Farm, St. Paul, Minnesota, on monospore cultures of *Sphacelotheca sorghi* from sorghum [*R.A.M.*, xiii, p. 436] in various parts of the United States and from Sudan grass [*Andropogon sorghum* var. *sudanensis*] in the experimental garden, St. Paul.

The optimum temperature for seedling infection by *S. sorghi* was found to be 25° C. [ibid., ii, p. 12; iv, p. 158]. The fungus showed little tendency towards heterothallic fusion in culture [see preceding abstract], but there were other indications of multipolar sexuality (a number of sexual groups) as found by Bauch in *Ustilago zeae* [ibid., xii, p. 88]. Certain combinations of monosporidial lines from a single promycelium proved pathogenic in groups suggesting the presence of two sex groups only, but combinations between monosporidial lines from different smut spores revealed the existence of a larger number. Pronounced variations in nearly all characters were shown by the different monosporidial lines in culture, particularly striking being the divergences of colour and the occurrence of sectoring. Twelve sporidial 'batches' (a 'batch' being the four sporidia of a promycelium) of two monosporidial lines, one black and the other yellowish-brown, were studied from the standpoint of colour inheritance. Three colours developed in the progeny—black, intermediate, and yellowish-brown—in the following segregation ratios: 2:2:0, 2:0:2, 1:2:1, 1:1:2, 0:1:3, and 0:0:4.

Mitra (M.) & Mehta (P. R.). **Diseases of Eleusine coracana Gaertn. and E. aegyptiaca Desf. caused by species of Helminthosporium.**—*Indian J. agric. Sci.*, iv, 6, pp. 943–975, 4 pl. (1 col.), 7 graphs, 1934. [Received April, 1935.]

This is a full report of the authors' morphological, cultural, and pathogenicity studies of *Helminthosporium nodulosum* which is stated

to be widespread and very destructive in India on *Eleusine coracana* and to have been isolated from *E. aegyptiaca* at Pusa, and of a strain of *H. leucostylum* (termed *C.*) which was found causing a much less severe disease of *E. coracana* in Pusa [*R.A.M.*, xiii, pp. 77, 159; xiv, p. 161]. Besides seedling blight, leaf spots, and head blight which are caused by both organisms, *H. nodulosum* causes foot and root rot and attacks the floral parts, especially in wet weather, penetrating the young grains and checking their development. The various symptoms of attack are described in some detail.

Inoculation experiments indicated that all the organs of the hosts may be attacked by both organisms, seedlings being apparently more susceptible to *H. nodulosum*. This species can infect the aerial parts of *E. coracana* within a temperature range from 10° to 37·5° C. with an optimum between 30° and 32°. It infects the leaves more readily from the upper surface or between the leaf and the leaf sheath, and enters through the stomata, epidermal cells, or more frequently through certain epidermal outgrowths. Cross-inoculation experiments showed that both species have a wide host range, including maize, sorghum, *Pennisetum typhoideum*, and *Panicum frumentaceum*. *H. nodulosum* caused small spots on sugar-cane, which was not infected by *H. leucostylum*.

Studies in pure cultures showed that the macroscopic (aerial mycelium, colour, and zonation) and microscopic (sporulation, shape, size, and septation of conidia and conidiophores, formation of chlamydospores and secondary spores) growth features of *H. nodulosum* and *H. leucostylum* are affected by environmental conditions such as light and darkness, temperature, humidity of air and media, and the like. The growth rate of both species varied with the nature of the medium used, and that of *H. nodulosum* also with some other factors such as the amount of medium and humidity. The *C.* strain of *H. leucostylum* was shown to be a comparatively slow growing fungus, differing from Drechsler's type species in its conidiophores, which are conspicuously slender at the basal part, gradually becoming broader at the flat or anvil-shaped top, and in its olive-brown conidia, with 1 to 6 septa, measuring 18 to 78 by 10 to 12 μ, while those of *H. leucostylum* type are deep olivaceous, with 1 to 8 septa, and measure 15 to 67 by 11 to 17 μ.

Davies (R.). **Fungal invasion of navel Oranges.**—*Rep. Low Temp. Res. Lab., Capetown, 1933*, pp. 114–120, 1 graph, 1935.

By using the method of Gregory and Horne [*R.A.M.*, vii, p. 586] the author studied the course of invasion of navel oranges in 1932 and 1933 from different localities in South Africa (approximately 100 fruit from each) by *Penicillium digitatum* [ibid., xii, p. 167; xiv, p. 96]. The results obtained [which are tabulated and discussed] showed that resistance varied much more from season to season than from district to district in either season. The evidence also indicated that there may be a gross correlation between resistance and the amount of wastage occurring in export fruit, presupposing (as is likely) that the degree of resistance to wastage is correlated with the degree of resistance to mechanical injury. The mean rate of invasion per day for fruit picked early in the season in one area was 0·399 ($\pm$0·0110) cm., while that for the fruit picked late in the same locality was 0·323 ($\pm$0·0076). The differ-

ence in these rates is regarded as significant; if a definite relationship is established between resistance to infection and susceptibility to mechanical injury, the bearing of these results on the relationship of insect injuries to the inherent qualities of the fruit will require investigation.

'Wilting' the fruit for a period of 5 days before inoculation lowered the resistance to fungal invasion, while wilting for 10 days before had very little effect; the storage of non- and 5 days-wilted fruit for 3 or 6 weeks prior to inoculation also lowered resistance.

High resistance was associated with a low moisture content of pulp and rind, high total soluble solids and titratable acid in the juice, and with high ash, potash, calcium, magnesium, and phosphorus content.

Beyers (E.). **Comparison of Klotz's vitality test for Lemons with invasion by Penicillium digitatum as a means of determining the susceptibility of Oranges to wastage.**—*Rep. Low Temp. Res. Lab., Capetown, 1933*, pp. 120–122, 1935.

A comparison was made of the author's method of testing the susceptibility of Washington navel oranges to infection by *Penicillium digitatum* [see preceding abstract] (random samples being pre-cooled for two days at 40° F., inoculated by a hypodermic syringe with about 1 c.c. of spore suspension of the fungus into the inner rind bordering the flesh at the side of the orange, dipped in alcohol, drained, wrapped, packed, and stored for about 30 days at 40°) with Klotz's rapid method for testing the storage life of lemons (based on the time-rate of reduction of a permanganate solution by the materials exosmosing from the fruit into water). The resulting two sets of [tabulated] data were compared statistically and showed that under the experimental conditions there was no relationship between the time of colour reduction in Klotz's test and the diameter of infection area in the author's method. This is attributed to the impossibility in practice of finding a completely uninjured rind in fruits subjected to ordinary handling; minute wounds in the outer rind may permit considerable exosmosis of reducing substances and so give a very low figure in the vitality test, although the fruit may in fact be highly resistant.

Camp (A. F.). **Zinc sulfate as a soil amendment in Citrus groves.**—*Proc. Fla hort. Soc., 1934*, pp. 33–38, 1934. [Abs. in *Chem. Abstr.*, xxix, 8, p. 2642, 1935.]

Zinc sulphate (89 per cent.), applied in March and June at the rate 0·25 to 2 lb. per tree to badly frenched seven-year-old Satsuma oranges [*Citrus nobilis* var. *unshiu*] at Gainesville, Florida [*R.A.M.*, vii, p. 441], caused a marked and rapid improvement [cf. ibid., xiv, pp. 176, 302]. A similar treatment was ineffectual, however, in the case of mild frenching of orange and grapefruit trees in other parts of the State. The condition of severely frenched Pineapple oranges was ameliorated by the application of zinc sulphate to the soil at the rate of 10 to 15 lb. per tree, while a very pronounced improvement was obtained by spraying the leaves of such trees with a solution of 5 lb. zinc sulphate and 5 lb. lime in 50 galls. water. Definite, though somewhat less striking results have also been secured by similar treatments on Valencia oranges.

Bahrt (G. M.). **Soil fertility and bronzing of Citrus.**—*Proc. Fla hort. Soc., 1934*, pp. 18–20, 1934. [Abs. in *Chem. Abstr.*, xxix, 8, p. 2647, 1935.]

Bronzing of citrus trees in the more advanced stages is characterized by a profusion of dead wood, falling leaves, reduction in new growth, decrease in fruit yield, and a marked change in the colour of many of the leaves from green to deep yellow. The addition to a complete fertilizer of ground or dolomitic limestone, magnesium sulphate (0·125 to 0·625 lb. per tree), or ground limestone plus magnesium sulphate (2 to 6 lb.) resulted in early indications of improvement. In a few cases the application of extra quantities of superphosphate, potassium sulphate, and calcium sulphate ameliorated the condition of the trees. The soil to a depth of 18 in. below bronzed trees was found to be almost uniformly lower in total and nitrate nitrogen, calcium oxide, and organic matter than that beneath normal ones.

King (C. J.), Eaton (E. D.), & Hope (C.). **Catalase activity in relation to age and viability of sclerotia of the Cotton root-rot fungus.**—*J. agric. Res.*, xlix, 10, pp. 897–902, 1 fig., 1934.

After a brief reference to observations which showed that the gradual darkening of colour which occurs with age in the sclerotia of *Phymatotrichum omnivorum* [*R.A.M.*, xiv, p. 360] is not a reliable indicator of the age or vigour of these bodies, the author gives a few details of experiments which indicated that the catalase activity of the macerated tissues of the sclerotia as a rule declined with age. A great or abrupt reduction in this activity, however, only occurred in sclerotia beginning to lose germination power, and there was a suggestion that an after-ripening process, comparable to that in certain seeds, takes place in the sclerotia, during which the catalase activity reaches its maximum. This activity appeared to be closely related to the metabolic condition of sclerotial tissues, and might serve as an indicator of their age, and as a test for varying degrees of vigour or of death. It was further shown that catalase activity rapidly declines when the sclerotia are dried.

Jordan (H. V.), Dawson (P. R.), Skinner (J. J.), & Hunter (J. H.). **The relation of fertilizers to the control of Cotton root rot in Texas.**—*Tech. Bull. U.S. Dep. Agric.* 426, 76 pp., 35 figs., 2 maps, 1934. [Received May, 1935.]

Investigations [which are fully described] into the relation of soil fertility and the use of fertilizers to the control of cotton root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xiii, pp. 632, 633, 698] in Texas showed that the acceleration of maturity brought about by the fertilizers in most instances reduced the losses from the disease, while the increases in total yield were generally more than large enough to compensate for the cost of the treatment. Losses were significantly reduced where fertilizers effectively enhanced the vigour and yield of the plants, indicating that the continued use of appropriate fertilizers in conjunction with other measures to restore or maintain fertility may eventually effect a material amount of control, economically profitable even on soils where the increased yields are relatively low, and when

combined with rotation, fallowing, and other cultural measures, may even lead to the eradication of the disease in fields so treated.

King (C. J.), Hope (C.), & Eaton (E. D.). **Some microbiological activities in manurial control of Cotton root rot.**—*J. agric. Res.*, xlix, 12, pp. 1093–1107, 3 figs., 1 diag., 1 graph, 1934.

In continuation of the investigation of the controlling effect of manuring on the cotton root rot disease (*Phymatotrichum omnivorum*) [see preceding abstract], the authors give an account of experiments in 1933 at Sacaton, Arizona, the results of which showed that, as determined by a slight modification of Cholodny's method of direct microscopic examination [see below, p. 469], bacteria, actinomycetes, and saprophytic fungi were more abundant in plots that had received organic manures for several years than in the alternating unmanured plots; *P. omnivorum* alone was more abundant in the unmanured plots. This would suggest that the dense population of organisms engaged in the decomposition of the organic materials developed a soil condition temporarily unfavourable for the growth and activity of the cotton root rot fungus. There was also some evidence of actual parasitism of the hyphae of *P. omnivorum* by certain of the other organisms.

Eaton (E. D.) & King (C. J.). **A study of the Cotton root-rot fungus (Phymatotrichum omnivorum) in the soil by the Cholodny method.**—*J. agric. Res.*, xlix, 12, pp. 1109–1113, 2 figs., 1 diag., 1934.

The main feature of this paper is a description of a special holder devised by the authors to maintain the glass slides used in Cholodny's method for the microscopic study of the soil microflora [see preceding abstract] at determined depths in the soil up to about 3 feet, for the special purpose of investigating the growth and development of the mycelium of *Phymatotrichum omnivorum* in the soil under natural field conditions. Preliminary observations indicated that the fungus was active in the soil at least six weeks before the appearance of the first symptoms of root rot on adjacent cotton plants; the growth of the mycelium in the soil did not appear to be connected with roots, as it developed in a clean fallow.

Petch (T.). **Notes on entomogenous fungi.**—*Trans. Brit. mycol. Soc.*, xix, 3, pp. 161–194, 7 figs., 1935.

Besides the 11 species of *Cordyceps* which are discussed in this series of his notes on entomogenous fungi [*R.A.M.*, xiii, p. 161] the author describes *Stereocrea coccophila* n.sp. on a scale insect on *Eugenia* sp. in Ceylon; *Patellina epimyces* n.sp. parasitic on *Hirsutella versicolor* and *H. entomophila*; *H. formicarum* n.sp. (conidial stage of *Ophiocordyceps unilateralis*) in British Guiana and Ceylon; *H. radiata* n.sp. on flies in British Guiana; *Blastotrichum aranearum* n.sp. on spiders in Ceylon; *Verticillium fuliginosum* n.sp. on a leafhopper on sugar-cane in Surinam and Panama; *Sporotrichum columnare* n.sp. on *H.* spp. in the West Indies; and *Metarrhizium brunneum* n.sp. on a Homopterous insect (Cicadellidae) in the Philippine Islands. Notes are also given on *Entomophthora aprophorae*, and on *Aschersonia caespitica* which is stated

to be the imperfect stage of *Hypocrella amomi*, as well as on some other entomogenous fungi.

Bartlett (K. A.) & Lefebvre (C. L.). **Field experiments with Beauveria bassiana (Bals.) Vuill., a fungus attacking the European Corn borer.**—*J. econ. Ent.*, xxvii, 6, pp. 1147–1157, 1934.

It is apparent from the results [which are fully described and tabulated] of large-scale field experiments conducted from 1930 to 1932 in Massachusetts in the control of the European corn borer (*Pyrausta nubilalis*) by inoculation with *Beauveria bassiana* [*R.A.M.*, xi, p. 299; cf. also xiv, p. 361] that the insect is readily susceptible to infection during the very early larval stage. An appreciable reduction in the incidence of larval survival may be effected by dusting fields of infested maize and weeds with a mixture of spores and flour in the proportion, e.g., of 10 gm. : 8 lb. The fungus has been found to be capable of overwintering in the field and re-establishing itself naturally on new larvae in the following season, but further investigations are necessary to determine its practical value as a spontaneous enemy of the corn borer.

Lamb (J. H.) & Lamb (Margaret L.). **A grouping of the Monilias by fermentation and precipitin reactions.**—*J. infect Dis.*, lvi, 1, pp. 8–20, 4 graphs, 1935.

On the basis of sugar fermentation and precipitin tests [which are fully described and the resulting data tabulated], three groups of yeast-like fungi of the *Monilia* type associated with various human ailments are differentiated, namely (1) *M.* [*Candida*] *albicans*, *M.* [*C.*] *psilosis*, and *M. candida* [*C. vulgaris*]; (2) *M.* [*C.*] *parapsilosis*; and (3) *M.* [*C.*] *krusei* [cf. *R.A.M.*, xiii, p. 636; xiv, p. 34].

Wile (U. J.). **Cutaneous torulosis.**—*Arch. Derm. Syph., N.Y.*, xxxi, 1, pp. 58–66, 4 figs., 1935.

Full clinical details are given of a fatal case of generalized torulosis, culminating in meningitis, in a 17-year-old boy [cf. *R.A.M.*, xiii, p. 236]. The causal fungus (*Torula* (?) *histolytica*), which was found in the glands of the neck, in the brain, and in cutaneous lesions (of a somewhat different type from those previously described), occurs in the shape of well-defined, double-contoured, yeast-like bodies. The condition is readily distinguishable from blastomycosis [cf. ibid., xiii, p. 162; xiv, p. 168] by the lack of abscess formation and by the immense numbers of organisms occurring and enclosed within giant cells throughout the infected regions, and from coccidioidal granuloma [*Coccidioides immitis*: see next abstracts] not only by the foregoing features but also by the absence of endosporulation.

Ciferri (R.) & Redaelli (P.). **Studii sul Coccidioides immitis Stiles. IV. Caratteristiche culturali, biochimiche, patogenetiche e micromorphologiche in vivo ed in vitro dei ceppi tipici.** [Studies on *Coccidioides immitis* Stiles. IV. Cultural, biochemical, pathogenic, and micromorphological characters of the type strains *in vivo* and *in vitro*.]—*Boll. Soc. ital. Biol. sper.*, ix, 9, pp. 961–962, 1934.

In further studies of *Coccidioides immitis* [*R.A.M.*, xiv, p. 362] the authors found that the following type strains, viz., *Blastomycoides*

immitis [ibid., x, p. 104], Moore's strain [ibid., xii, p. 170], Weidman's strains nos. 1136, 1091, 1676, 1978, da Fonseca's strain [ibid., vii, pp. 167, 719], and *Geotrichum louisianoideum* [ibid., xiii, p. 162] showed closely similar cultural, morphological, and biochemical characters [which are briefly discussed], while all produced fatal lesions in laboratory animals [ibid., xiii, p. 235]. Under parasitic conditions (i.e., in inoculated susceptible animals and naturally infected human beings) the hyphae undergo rapid lysis, while the chlamydospores, which function as hypnospores, swell and become plurinucleate; by a progressive cleavage of the protoplasm the endospores, which the authors regard as 'aplanetic' [non-motile] zoospores, become differentiated, being released by the rupture or partial lysis of the sporangium.

Ciferri (R.) & Redaelli (P.). **Studii sul Coccidioides immitis Stiles. V. Caratteristiche culturali, biochimiche, patogenetiche e micromorphologiche in vivo ed in vitro dei ceppi degradati.** [Studies on *Coccidioides immitis* Stiles. V. Cultural, biochemical, pathogenic, and micromorphological characters of the degenerate strains *in vivo* and *in vitro*.]—*Boll. Soc. ital. Biol. sper.*, ix, 9, pp. 963–964, 1934.

A study of the following degenerate strains of *Coccidioides immitis*, viz., *Geotrichum immite* (Castellani) Agostini, *Blastomycoides immitis* Castellani (Ciferri's strain), and *B. dermatitidis* Castellani [*R.A.M.*, xiii, p. 235], of which Agostini's and Ciferri's strains were derived from Castellani's, but had for some years been kept in culture under environmental conditions different from those of the parent, showed that the cultural, morphological, and biochemical characters were not different from those of the parent or any of the type strains previously investigated [see preceding abstract]; inoculations of laboratory animals, however, demonstrated that they had lost virulence, and the few zoosporangia which developed in the inoculated animals were smaller and contained only a few small zoospores. These strains more readily succumbed to the defensive action of the tissues than the original ones.

These changes may explain the existence of permanently degenerate strains in localities remote from the normal geographical source of *C. immitis* (California), which cause mild infections only. A case in point is that of *Glenospora meteuropaea* [*C. immitis* var. *meteuropaea*: ibid., xiv, p. 100] isolated from a comparatively mild human infection in Naples.

De Monbreun (W. A.). **The cultivation and cultural characteristics of Darling's Histoplasma capsulatum.**—*Amer. J. trop. Med.*, xiv, 2, pp. 93–125, 5 pl., 1 fig., 1934.

A fungus cultivated for the first time from a case of Darling's histoplasmosis [see next abstract] was experimentally proved by inoculation into monkeys (*M* [*acacus*] *rhesus*) to be the agent of the disease. It may be cultivated either in the (pathogenic) yeast-like form in which it occurs in the lesions or as a mycelium.

Although certain cultural characters of the organism (*Posadasia*) [*capsulata*] are suggestive of a relationship with the Endomycetales, the retention of the name *Histoplasma capsulatum* [*R.A.M.*, xiv, p. 235] is advocated pending further studies. It is recommended, moreover, that

the present clinical term 'histoplasmosis' be changed to 'cytomycosis' with a view to emphasizing the nature of the etiological agent and its connexion with the host cells.

Dodd (Katharine) & Tompkins (Edna H.). **A case of histoplasmosis of Darling in an infant.**—*Amer. J. trop. Med.*, xiv, 2, pp. 127–136, 2 pl., 1934.

Clinical details are given of a fatal case of Darling's histoplasmosis (*Histoplasma capsulatum*) [or *Posadasia capsulata*: see preceding and next abstracts] in a six-months-old white boy, a native of Tennessee, this being the first report of the disease in infancy and the third of its occurrence in North America. The diagnosis was made from the blood during life by the detection of the parasite in the large mononuclear cells. Many of the symptoms of the disease may be explicable by the action of the these cells in plugging the blood-vessels, destroying the alveoli of the lungs, massively invading the bone marrow, and eliminating the red cells.

Ciferri (R.) & Redaelli (P.). **Sulla posizione sistematica dell'agente patogeno del farcino equino.** [On the systematic position of the pathogenic agent of equine farcy.]—Reprinted from *Bol. Ist. sieroter. Milano*, fasc. 10, 8 pp., 1934. [German summary.]

This paper, in which the authors describe their comparative study of *Histoplasma capsulatum* [or *Posadasia capsulata*: see preceding abstracts], *Cryptococcus farcinimosus*, and *C. muris* and adduce their reasons for transferring the two last-named organisms to the genus *Histoplasma*, is an expanded version of one already noticed from another source [*R.A.M.*, xiv, p. 235].

Allen (F. R. W. K.). **Five cases of rhinosporidiosis, four in females.**—*Indian med. Gaz.*, lxx, 2, p. 76, 1935.

Clinical details are given of five cases of rhinosporidiosis examined at the Raipur Main Hospital, India, four of which were in females. *Rhinosporidium* [*seeberi*: *R.A.M.*, xiv, p. 100] was detected in the nasal tumours in each patient. It is considered probable that the spores of the fungus are inhaled during rice-husking and become lodged in abrasions of the nasal mucous membrane whence the tumour develops.

Brieger (F. G.). **Antirrhinum rust.**—*Gdnrs' Chron.*, xcvii, 2512, pp. 113–114, 1935.

Observations at the John Innes Horticultural Institute, Merton (Surrey), have shown that the wild species of *Antirrhinum*, *A. molle*, *A. glutinosum*, and others are susceptible to a varying extent to rust [*Puccinia antirrhini*: *R.A.M.*, xiv, p. 364], while hybrids between such species as *A. latifolium*, *A. hispanicum*, and *A. barrelieri* on the one hand and *A. majus* on the other contract heavy infection.

Poeverlein (H.). **Puccinia antirrhini Dietel et Holway, ein neuer Eindringling aus Nordamerika.** [*Puccinia antirrhini* Dietel et Holway, a new intruder from North America.]—*Ann. mycol., Berl.*, xxxiii, 1–2, pp. 104–107, 1935.

Attention is briefly drawn to the recent intrusion of the North

American *Puccinia antirrhini* [see preceding abstract] into France, England, Denmark, and Germany, with a list of twenty-six localities in the last-named country in which the rust has been found to date.

Storck (A.). **Ein Anbauversuch zur Welkekrankheit der Sommerastern.** [A cultivation experiment on the wilt disease of the Summer Aster.] —*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 7, p. 83; 8, pp. 93–94, 1935.

Either of two fungi may be responsible for the wilt disease that is threatening the summer aster [*Callistephus chinensis*] cultivation in Germany, *Fusarium oxysporum* f. 6 [*R.A.M.*, xii, p. 448; cf. ibid., xiv, p. 172] or *Verticillium albo-atrum* [ibid., vii, p. 9] predominating in different types of soil and climate but causing much the same external symptoms. The writer's trials at Berlin-Dahlem with a number of Californian, German, French, and Italian aster varieties were concerned primarily with the former organism, a high degree of susceptibility (round about 80 per cent.) to which was shown by two French strains of Herkules and the Italian Leuchtfeuer, followed by three more of Italian origin—dwarf chrysanthemum (62), American Bush (54), and Californian Giant (46), and the German Frankreich (43). A complete absence of infection was shown by Bodger's (California) Original China American Beauty, Crego, King, American Bush (U.S.A.), and Early-flowering Beauty, as well as by Ball's (Chicago) Improved Crego Giant Cattleya and Incomparable American Bush, only a trace by Ball's Early White, and under 5 per cent. by Bodger's Giant Peony, Washington, and Comet, and by Ball's Early King Peach-blossom and Heartblood.

Gante (T.). **Echter Mehltau auf Begonienblättern in Deutschland.** [True mildew on Begonia leaves in Germany.]—*NachrBl. dtsch. PflSchDienst*, xv, 2, pp. 14–15, 1935.

In November, 1934, Konkurrent begonia leaves were submitted to the Geisenheim (Rhine) Phytopathological Experiment Station showing brown spots, 0·5 cm. or more in diameter, covered with the whitish mycelium of *Oidium begoniae* Putt., hitherto reported, according to Pape, from America and Denmark [*R.A.M.*, xii, p. 448]. Perithecia being absent, no more exact determination of the fungus was possible.

Manil (P.). **Une maladie bactérienne du Lilas, nouvellement constatée en Belgique.** [A bacterial disease of Lilac newly recorded in Belgium.]—*Bull. Inst. agron. Gembloux*, iv, 1, pp. 90–91, 1935.

In May, 1934, the author received lilac specimens showing symptoms of bacterial blight on the leaves and branches from several localities in Belgium, a country where the disease had not previously been recorded. From affected material an organism was isolated which agreed with Bryan's description of *Bacterium* [*Pseudomonas*] *syringae* [*R.A.M.*, vii, p. 515; xiv, p. 319], and inoculations with this on healthy lilacs either by needle-pricks or aspersion gave positive results, the incubation period for the former method ranging from three to seven days. Inoculations of plums, apples, and pears with the same organism gave negative results.

Hendrickx (L.). **Un nouvel hôte du Bacterium tumefaciens.** [A new host of *Bacterium tumefaciens*.]—*Bull. Inst. agron. Gembloux*, iv, 1, p. 90, 1935.

One month after the stem of a young rosette of *Sempervivum tectorum* had been inoculated by needle-prick with an American strain of *Bacterium tumefaciens* isolated from a gall on raspberry [*R.A.M.*, xiv, p. 288] a tumour developed at the site of inoculation, the characteristic arrangement of the leaves was destroyed, and the new leaves formed were larger and thicker than those on the controls; a general chlorosis set in, and the lower verticils became completely necrosed.

Smith (C. O.). **Inoculations of Stagonospora curtisii on the Amaryllidaceae in California.**—*Phytopathology*, xxv, 2, pp. 262–268, 1 fig., 1935.

Positive results were given by inoculation experiments with *Stagonospora curtisii*, the agent of leaf scorch of *Narcissus* sp. and *Hippeastrum vittatum* hybrids in California [*R.A.M.*, xiii, p. 167], on the following additional Amaryllidaceae: *Amaryllis belladonna*, *Chlidanthus fragrans*, *Crinum powelli*, *Galanthus* sp., *Hymenocallis calathina*, *Leucojum vernum*, *Lycoris squamigera*, *Pancratium maritimum*, *Sternbergia lutea* [*S. citrina*], and *Zephyranthes candida*. The spores of the fungus (with which, among others, *Phyllosticta gemmipara* [ibid., viii, p. 649], *Phoma amaryllidis* [ibid., viii, p. 578], and *Stagonospora crini* [ibid., xiii, p. 772] are believed to be synonyms) are variable in shape and size (small and continuous or large and up to 5-septate), the former predominating in culture. They were found to be viable in dry herbarium material after one year.

Sibilia (C.). **'Saltazioni' in Heterosporium gracile.** [Saltations in *Heterosporium gracile*.]—*Boll. Staz. Pat. veg. Roma*, N.S., xiv, 4, pp. 447–474, 14 figs., 1934. [English summary.]

From monoconidial cultures of *Heterosporium gracile* [the conidial stage of *Didymellina macrospora*: R.A.M., xi, p. 559], isolated from iris leaves in Italy, the author obtained many modifications and some saltations, including an albino, sterile strain, produced either as a sector or as a change in a whole monoconidial culture, which remained invariable for about two years. He also obtained a zonated, white and brown strain, unreversible in normal growing conditions, and many strains differentiated from the original culture in colour and zonation which, however, later reverted. When two of the strains were submitted to the action of radium, two saltations were produced which remained unchanged through many generations; when the same strains were exposed to ultra-violet rays, no sudden variations arose. Variations of temperature determined in the one strain the appearance of an albino, sterile form, and in the other, sectors resembling a strain obtained earlier. When zinc sulphate was added to the medium, the genetic equilibrium of the strains was profoundly modified, many saltant sectors being produced, some showing a dendritic type of growth. Tests with three of the strains, including the albino one, showed no modification in pathogenicity to iris.

Bennett (F. T.). **Rhizoctonia disease of turf.**—*Gdnrs' Chron.*, xcvii, 2513, p. 129, 1 fig., 1935.

A comparison of a *Rhizoctonia* isolated from the small 'dollar spot' type of disease in lawn turf in northern, eastern, and southern England during the last two years with the species found by Monteith on similar patches in the Unites States [*R.A.M.*, v, p. 742; cf. also xiv, p. 240] showed the two to be identical. In the writer's opinion, the species concerned in the causation of the disease in either country is not *R. solani* but a hitherto undescribed species, which is provisionally named *R. monteithianum*. The mycelium of the fungus is thin, downy, white with a faint bluish tinge, and consists of slender, thin-walled, hyaline, widely septate hyphae, averaging 2 (occasionally 5 to 7) μ in diameter; the constrictions at the junctions between the main hypha and the lateral branches characteristic of *R. solani* are inconspicuous or absent, while clamp-connexions, another typical feature of the latter, are very rare. The few brown hyphae occurring among the predominantly hyaline growth fail to impart the familiar cinnamon colour of *R. solani*. In Petri dish cultures on starchy media, patches of the mycelium become converted into thin greenish to olivaceous-black flakes composed of narrow hyphae with brown walls interwoven into a small-celled mosaic. Under natural conditions the appearance of the diseased turf in England exactly resembles the descriptions of 'small brown patch' or 'dollar spot' in the United States. The *Rhizoctonia* from grasses in the latter country will not infect living potato tissue.

Kozlowski (A.). **Little leaf or rosette of fruit trees in California.**—*Phytopathology*, xxv, 2, pp. 275–278, 1935.

Details are given of the writer's observations and experiments on a type of little leaf or rosette of peach, apple, and plum trees in California from which it is apparent that three factors are concerned in the disorder, namely, anaerobic soil conditions, infection by species of *Monilia* (probably of the *M. cinerea* [*Sclerotinia laxa*] group) specially prevalent on plums in deep sand, and climate (warm, rainless weather). In apple shoots infected by the *Monilia* the meristematic tissues of the terminal buds were entirely destroyed, the hairs of the scales being covered with the hyphae and conidia of the fungus, which was further isolated from brown spots in the bark parenchyma of peach buds. The leaves of the diseased trees are small, stiff, of glassy aspect, and clustered; a witches' broom-like growth of the shoots is tentatively attributed to another undetermined fungus. Little leaf was produced in controlled trials by simulating the adverse environmental conditions referred to above, and also by inoculation with the *Monilia*, but the latter requires further investigation.

Bongini (V[irginia]). **Seccherecio di piante fruttifere.** [Drying-up of fruit trees.]—*Difesa Piante*, xi, 6, pp. 169–185, 1934.

After an inclement winter and spring, three- to six-year-old fruit trees in northern Italy showed a drying-up of the youngest branches and trunk which frequently proved fatal.

On apricots, dry, slightly wrinkled areas appeared on the trunk and

spread downwards, a necrosis of the underlying tissues extending to the cambium; the shoots dried up and the bark sometimes became detached. The trunks bore verrucose, black, depressed, stromatic fructifications of *Cytospora rubescens* [*R.A.M.*, xii, p. 281] with large, sinuous, irregularly distributed chambers lined with conidiophores, 30 to 35 μ long, bearing allantoid, hyaline, continuous conidia, 4 to 4·5 by 0·5 to 1 μ.

The only peach variety attacked was Early Hale, which is very susceptible to climatic influences. Affected trees showed necrosis of the subcortical tissues of the young branches, extending to the xylem. The internodes bore erumpent greyish-white pustules containing two or more spherical chambers disposed radially, measuring 100 μ in diameter, and lined with simple, hyaline conidiophores, 15 to 20 μ long, bearing cylindrical-curved, hyaline, continuous conidia, 5 to 7 by 1·5 μ. This fungus the author considers to be *C. cincta*. The pycnidia of *C. persicae*, measuring 55 to 65, with spores by 0·5 to 1 μ, were found around the dead shoots. Another *Cytospora*, of which the conidiophores measured 12 to 15 by 1 μ and the filiform, simple conidia 5 to 6·5 by 0·5 to 1 μ, was present on the trunks.

On apples and pears the affected branches bore fructifications of *C. microspora* [ibid., viii, p. 318] with polymorphous chambers containing bacillary conidiophores 16 to 18 μ long, and discharging through a central ostiole a white conidial cirrhus.

The author concludes that the wilt and death of the trees were due primarily to frost injury and adverse soil factors. Trees growing in good soil and belonging to varieties less susceptible to the effects of bad weather remained unaffected, and some of the affected trees which rapidly succumbed showed no fungal development.

Rose (D. H.), Brooks (C.), Fisher (D. F.), & Bratley (C. O.). **Market diseases of fruits and vegetables. Apples, Pears, Quinces.**—*Misc. Publ. U.S. Dep. Agric.* 168, 69 pp., 22 pl. (16 col.), 1933. [Received May, 1935.]

In this publication, one of a series designed to assist in the identification of economically important pathological conditions of fruits and vegetables during marketing and so facilitate market inspections, notes are given on the causes, symptoms, and control of nearly eighty diseases and types of physiological injury affecting apples, pears, and quinces in the United States. The book is illustrated with a valuable series of coloured plates, and there is a very full bibliography of the papers in English on the subject, comprising 244 titles.

Copisarow (M.). **A new method of fruit and vegetable preservation.**—*J. Soc. chem. Ind., Lond.*, liv, 13, p. 283, 1935.

Promising results in the prevention of moulds and decay in ripe apples, pears, citrus, pineapples, and bananas are stated to have been obtained in preliminary tests by spraying with solutions or suspensions of maleic acid in various ethereal oils, e.g., lemon and orange, ethyl and amyl acetate, iso-amyl valerate, the selection of which was governed by the flavour of the particular fruit to be treated.

Thomas (P. H.) & Raphael (T. D.). **Armillaria control in the orchard.**—*Tasm. J. Agric.*, N.S., vi, 1, pp. 1–6, 4 figs., 1935.

After pointing out the difficulty of detecting the presence of *Armillaria mellea* on the roots of orchard trees before considerable damage has been done to the hosts, the authors briefly discuss protective and preventive measures against its establishment on recently cleared land. Such land should not be planted with fruit-trees for several years owing to the presence in the soil of abundant rotting roots and wood chips almost certain to harbour the fungus. Drains should not be constructed of bush timbers, and the underground parts of fencing posts and permanent tree supports should be tarred or creosoted prior to erection. Care should be taken during cultivation to avoid injuring the fruit-tree roots. All wooden material showing the typical clusters of the sporophores at their base should be removed and burnt. In already infected orchards the less affected trees should have their roots uncovered in summer and left exposed to the action of sunlight, and two or three applications of iron sulphate (1 lb. in 4 galls. water) may be given at intervals of three or four weeks; permanganate of potash ($\frac{1}{2}$ oz. in 4 galls. water) has also proved successful in checking the development of the fungus. Progress of *A. mellea* rhizomorphs in the soil may be checked by digging a trench about 2 ft. deep around the infected areas.

Harrison (T. H.) & El-Helaly (A. F.). **On Lambertella corni-maris von Höhnel, a brown-spored parasitic Discomycete.**—*Trans. Brit. mycol. Soc.*, xix, 3, pp. 199–214, 1 pl., 3 figs., 1 graph, 1935.

A detailed account is given of the authors' morphological and cultural studies of a Discomycete with brown spores, which was collected by the senior author from mummified apples in Switzerland and from mummified pears in Germany in 1931, and which was found to be identical with one collected by von Höhnel in 1917 on mummified fruits of the cornelian cherry (*Cornus mas*) and described by him under the name *Lambertella corni-maris*. The fungus was cultured on a large variety of media, on most of which it produced a thick, dark brown or black pseudosclerotial crust from which apothecia with ascospores [microscopical details of which are given] were formed under suitable conditions of light, humidity, and acidity. The optimum P_H for growth was near 4·4, but growth occurred over a range from 1·6 to 8·3. The existence in nature of an imperfect stage appears to be doubtful.

The fungus was shown to be very active in the production of oxidizing enzymes and pectinase and to be able under laboratory conditions to attack a variety of fruits and vegetables, including apple, pear, plum, quince, orange, lemon, turnip, and parsnip. It was also apparently capable under experimental conditions of attacking apple and plum blossoms, but inoculations of young apple, pear, cherry, and plum wood gave negative results.

In discussing the taxonomic position of the fungus especially with reference to the opinion of Whetzel that it is a typical *Ciboria*, and the possibility that it may be identical with *Phaeosclerotinia nipponica* Hori found on apples in Japan, it is considered that for the present at least it should be known as *L. corni-maris* v. Höhn.

Riker (A. J.), Ivanoff (S. S.), & Kilmer (F. B.). **Antiseptic solutions and antiseptic adhesive tape in relation to control of hairy root, crown gall, and other overgrowths on nursery Apple trees.**—*Phytopathology*, xxv, 2, pp. 192–207, 1935.

The work of the first-named writer and his collaborators on the control of knots caused by *Phytomonas* [*Bacterium*] *rhizogenes* at the unions of piece-root grafted nursery apple trees at the Wisconsin Agricultural Experiment Station [*R.A.M.*, xiii, p. 778] has been continued. Mercuric chloride (1 in 1,000) and cadmium chloride (1 in 100) killed all the bacteria without apparent injury to the roots, and the former was successfully incorporated, at a concentration of 1 to 300 by weight, in the plaster masses of nurserymen's tape wrappers. Under ordinary conditions commercial control was secured merely by wrapping the graft unions with this antiseptic tape, but in cases of heavy infection, the seedling roots should be immersed a week before grafting in mercuric chloride (1 in 1,000) for one minute.

Roberts (J. W.) & Pierce (L.). **Apple scab.**—*Fmrs' Bull. U.S. Dep. Agric.* 1478, 11 pp., 8 figs., 1935.

Popular notes are given on the economic importance, distribution, symptoms, life-history, effects on different varieties, and control of apple scab (*Venturia inaequalis*) in the United States.

Bottomley (A[veril] M.). **Sooty blotch on Apples.**—*Fmg. S. Afr.*, x, 106, p. 31, 2 figs., 1935.

The best control of sooty blotch (*Gloeodes pomigena*) on apples in South Africa was given in recent experiments by a one-minute dip in a 5 to 6 per cent. solution of bleaching powder (chloride of lime), followed by five to ten minutes' exposure and thorough washing in clean water, the fruit then being allowed to dry before packing [cf. *R.A.M.*, xii, p. 759]. Fly speck (*Leptothyrium pomi*), commonly associated with sooty blotch on light-skinned varieties, such as White Winter Pearmain, is not amenable to this treatment.

Roberts (J. W.) & Pierce (L.). **Apple bitter rot and its control.**—*Fmrs' Bull. U.S. Dep. Agric.* 938, 10 pp., 4 figs., 1935.

A popular account (superseding that issued in April, 1918) is given of the symptoms, etiology, mode of dissemination, life-history, and control of bitter rot of apples (*Glomerella cingulata*) [*R.A.M.*, xiv, p. 40]. The disease is most serious in the southern States on the Givens, Jonathan, Missouri Pippin, Ben Davis, and Grimes Golden varieties in the order named. Directions are given for the removal of the overwintering sources of infection (mummied fruit and cankers) during the dormant period and for treatment with Bordeaux mixture (4–4–50), which should ordinarily commence about 15th June and terminate between 1st and 5th August.

Nitimargi (N. M.). **Studies in the genera Cytosporina, Phomopsis, and Diaporthe. VII. Chemical factors influencing sporing characters.**—*Ann. Bot., Lond.*, xlix, 193, pp. 19–40, 6 figs., 2 graphs, 1935.

Using the method suggested by Seth [*R.A.M.*, xiii, p. 524] for the

determination of the chemical factors that influence the growth in culture of fungal strains attacking the apple, the author showed that in the strains tested by him (two strains of *Cytosporina ludibunda*, one of *Phomopsis* sp. from rose stems, two of *P. coneglanensis*, three of *P. citri*, and *Diaporthe* No. 159) increasing concentrations of sugar in the culture medium brought about a significant increase in the dimensions of the spores. In strains producing 'A' and 'B' spores [ibid., ix, p. 547] in the standard medium (2 gm. glucose per litre) the number of 'B' was increased and that of 'A' spores correspondingly decreased with increasing sugar, and at 128 gm. glucose per litre all the spores were of the 'B' type; in those that only give 'A' spores in the standard medium, 'B' spores were formed at the higher concentrations, except in *Diaporthe*. With a strain of *P. citri* which produced 'A', 'B', and 'C' (intermediate) spores in the standard medium, the number of the two last types was increased ('B' predominating), and that of 'A' spores was correspondingly decreased with excess of sugar. Increase in nitrogen, on the other hand, did not in any case induce the formation of 'B' spores, and caused a decrease in the number of 'B' spores in the strains which produced 'A' and 'B' spores in the standard medium. Increasing the sugar content of media rich in asparagin overcame the tendency to check the formation of the 'B' spores.

Variations in acidity or alkalinity and in other laboratory conditions of temperature or light did not appear to have a significant effect on the numerical proportions and dimensions of the different kinds of spore.

Du Plessis (S. J.). **Excessive drop of Winter Nelis blossoms.**—*Fmg. S. Afr.*, x, 107, p. 75, 1935.

Two types of blossom drop of Winter Nelis pears were encountered in an orchard in the Somerset West district of Natal. The most prevalent is characterized by the brown and yellowish discoloration, respectively, of the calyces and rest of the blossom before dropping, and is attributed to lack of cross-pollination. The other type is marked by blackening of the calyces and sometimes of the blossom stems before dropping; pure cultures of *Bacterium nectarophilum* [*R.A.M.*, xiii, p. 426] were readily obtained from the affected tissues. This organism may possibly be able to overwinter in old infected blossoms in the soil, in soil contaminated by the organism during the previous season, or in the fruit buds and between the bud scales, but there was no evidence of its hibernation in the old fruit spurs on which the diseased blossoms were borne, or in any part of the beehive, the duration of viability in honey being only about seventy hours. Bees are, however, the most important vectors of the disease, small insects and wind playing only a minor part in its dissemination. Positive results were given by the inoculation of blossoms with a suspension of crushed bees caught in the infected orchard, and with the water used for washing a hive in the vicinity [cf. ibid., xiv, p. 370].

Proper and timely pollination would seem to be the most important measure against excessive blossom drop of the type under discussion, the bacterial disease being responsible for only 10 to 20 per cent. of the damage in the experimental orchard. However, in localities where it may prove to be of greater significance, adequate control should be

given by the ordinary spraying with lime-sulphur and Bordeaux mixture used against *Fusicladium* [*Venturia pirina*].

Goidànich (G.). **Un marciume della Pesche causato da due specie di 'Fusarium' (Fusarium herbarum (Corda) Fr., f.1 Wr. e Fusarium poae (Peck) Wr.).** [A Peach rot caused by two species of *Fusarium* (*Fusarium herbarum* (Corda) Fr., f.1 Wr. and *Fusarium poae* (Peck) Wr.).]—*Boll. Staz. Pat. veg. Roma*, N.S., xiv, 4, pp. 475–491, 7 figs., 1934. [English summary.]

A full account is given of a peach rot, apparently not previously recorded in Europe, caused by *Fusarium herbarum* f. 1 and *F. poae* [cf. *R.A.M.*, iv, p. 487]. The disease attacked the fruit when very nearly ripe and still on the tree, and spread rapidly after picking. The affected fruits developed a large salmon-pink or vinous-red area surrounded by a white ring of aerial mycelium, the lesion being of the former colour when due wholly or mainly to *F. herbarum* and of the latter when due to *F. poae*. In practically every instance infection had taken place through insect punctures.

Artificial inoculations with both organisms, separately and together, gave positive results on wounded and unwounded fruits, infection being favoured by wounds, ripeness, and atmospheric humidity. The most susceptible variety (in nature) was Krummel October, with 5 to 10 per cent. infection.

Control consists in the prompt destruction of affected material.

Arnaud (G.) & Barthelet (J.). **Essais de traitements des arbres fruitiers et de la Vigne en 1934.** [Experiments in the treatment of fruit trees and of the Vine in 1934.]—*C.R. Acad. Agric. Fr.*, xxi, 5, pp. 186–189, 1935.

Excellent control of pear scab (*Venturia pirina*) on the susceptible Doyenné d'hiver and Beurré d'Hardenpont varieties was obtained in 1934 by three applications of 2 per cent. Bordeaux mixture on 16th April, 7th to 8th, and 19th May, of which the first was the most efficacious. The late attacks of unwonted severity occurring in October [cf. *R.A.M.*, xiii, p. 384] were not, however, completely prevented by the ordinary schedule, and experiments are planned to determine the value of a September application against this phase of the disease.

Copper oxychloride [concentrations not stated] gave adequate control of downy mildew (*Plasmopara viticola*) on Carignan vines.

Goidànich (G.). **La leptonecrosi dei Ciliegi e degli Albicocchi.** [Leptonecrosis of Cherries and Apricots.]—*Boll. Staz. Pat. veg. Roma*, N.S., xiv, 4, pp. 531–540, 4 figs., 1934. [English summary.]

After pointing out that non-parasitic leptonecrosis of plums in Italy [*R.A.M.*, xiv, p. 320] resembles pathologically the cambial degeneration and necrosis of apples and pears recently described by Petri [ibid., xiv, p. 317], the author states that he observed Lindegg's cherry wilt [ibid., xiii, p. 247] on cherry trees of all ages near Bologna, and that careful cultural and anatomical studies demonstrated that no parasitic organism was present and that the pathological characters resembled those of plum leptonecrosis.

Leptonecrosis was also observed on two 20- to 25-year-old apricots grafted on myrobolan plum and growing in well-manured soil in a situation in which they had probably been exposed to severe cold. Burbank plums growing in the vicinity had already shown the same condition for some years. In the affected branches the rust-red discoloration was restricted to the middle of the phloem, the wood being unaffected.

From the available evidence the disease would appear to have been due to maladaptation between stock and graft, though its appearance twenty years after grafting does not support this view. It is tentatively suggested that it may belong to the virus group of diseases, and further investigations are being made to elucidate this point.

Magie (R. O.). **Variability of monosporic cultures of Coccomyces hiemalis.**—*Phytopathology*, xxv, 2, pp. 131–159, 6 graphs, 1935.

The essential features of this expanded description of the writer's studies on the variability of monospore cultures of *Coccomyces hiemalis*, the agent of cherry-leaf spot in the United States, have already been noticed from a preliminary account [*R.A.M.*, xiv, p. 376].

Darrow (G. M.) & Detwiler (S. B.). **Currants and Gooseberries: their culture and relation to White Pine blister rust.**—*Fmrs' Bull. U.S. Dep. Agric.* 1398, 42 pp., 26 figs., 2 maps, 1934.

This bulletin on the cultivation of currants and gooseberries in the United States in relation to white pine blister rust [*Cronartium ribicola*] is a revision of No. 1024 in the same series [*R.A.M.*, iv, p. 100]. The section on diseases is contributed by C. L. Shear. The considered policy of the Department of Agriculture is to exclude the cultivated black currant from all parts of the States, its eradication being particularly urgent in the Pacific, Rocky Mountain, Atlantic, Appalachian, Ohio and Upper Mississippi Valleys, and Lake States [ibid., xiv, p. 220].

Johnson (M. O.). **The Pineapple.**—xii+306 pp., 2 col. pl., 94 figs., Paradise of the Pacific Press, Honolulu, 1935.

This attractively produced and competently written monograph of the pineapple should be a valuable addition to the literature, and its up-to-date account of the diseases and pests of the crop (especially those found in Hawaii) will undoubtedly make it useful to phytopathologists in all pineapple-producing countries. The diseases discussed include wilt, four types of which are stated to occur in Hawaii, namely, that due to 'starvation' (chiefly of nitrogen), that caused by nematodes, 'swamp' wilt in poorly drained areas (probably caused by species of *Pythium* and *Phytophthora*), and 'quick' wilt due to the activity of mealy bugs (*Pseudococcus brevipes*) [*R.A.M.*, xiv, pp. 84, 379]; root rots associated with *Nematosporangium rhizophthoron* [*Pythium arrhenomanes*: ibid., xi, p. 129; xiv, p. 95] and species of *Fusarium*, *Verticillium*, *Rhizoctonia*, and with *Rhizidiocystis ananasi* [ibid., viii, p. 657]; heart rot (*Phytophthora* spp.) [ibid., xiii, p. 527]; leaf spot, base rot, and black fruit rot (all due to *Thielaviopsis* [*Ceratostomella*] *paradoxa*); green fruit rot (*P. meadii*); ripe fruit rot; Kauai disease, a dry rot of a few of the eyes of the green fruit of uncertain cause described by Lyon in 1915 (*H.S.P.A.*

Planters' Rec., v, 13, pp. 125–139); fruit fermentation; bacterial fruitlet or black rot attributed by Serrano to *Erwinia* [*Bacillus*] *ananas* [ibid., xiv, p. 182] but stated by Sideris and Caldis to be due to an associated white bacterium, the yellow *B. ananas* being non-pathogenic; pink disease of the fruit caused by a bacterium and described by Sideris and Waldron in 1930 (*Pine News*, v, 4, pp. 79–93) as of comparatively small economic importance; eye rot (exogenous brown discoloration) of the fruit, caused by species of *Fusarium* and *Penicillium*; various fruit rots and blemishes caused by insects or physiological troubles; and the yellow spot virus disease [ibid., xii, p. 304].

In an appendix a key is given for the identification of the species and varieties of the genus *Ananas*, and the book terminates with very full references to literature up to 1933.

Serrano (F. B.). **Fruitlet black-rot of Pineapple in the Philippines.**—*Philipp. J. Sci.*, lv, 4, pp. 337–362, 6 pl., 1934.

This is a full account of the author's studies of bacterial black rot of pineapple fruitlets [see preceding abstract] which is stated to be one of the two major diseases of the crop in the Philippines, wherever the Smooth Cayenne variety is grown. Isolations from affected tissues, later confirmed by pathogenicity tests [details of which are given], showed that the condition is caused by a white, strictly aerobic, rod-shaped organism with rounded ends, a technical description of which is given, and which is named *Phytomonas* (*Bacterium* or *Pseudomonas* under Smith's or Migula's classification) *ananas* n.sp. It occurs usually in pairs, but also singly and sometimes in short chains, varies considerably in size depending on age (1·8 by 0·6 μ in 24-hour-old and smaller in older cultures), is motile by 1 to 4 polar flagella three or four times the length of the body, does not produce spores or capsules, is Gram-negative and not acid-fast, and is capable of producing a green pigment. On agar it forms white colonies becoming ivory-yellow, with undulate to lobate edges, a smooth or rugose surface, radiately ridged, pulvinate to effuse. It liquefies nutrient gelatine and Loeffler's blood serum, slowly reduces litmus without the production of acid, does not hydrolyse starch, ferments glucose readily, xylose, mannite, and lactose feebly, but not saccharose, reduces nitrates, and does not produce either hydrogen sulphide or indol. Its optimum temperature for growth is between 31° and 33° C., with death point between 51° and 53°, and the optimum reaction for growth is about P_H 5·5 in cultures with about 6 per cent. sugar. According to the chart of the Society of American Bacteriologists its index number is 5322–31124–2223.

In discussing the symptoms of the disease, the author states that it is evidently identical with a similar condition of the pineapple reported by Barker from Haiti [*R.A.M.*, v, p. 618], but is distinct from, and more serious than, the bacterial fruitlet brown rot previously described and attributed by himself to *Erwinia* [*Bacillus*] *ananas* [ibid., vii, p. 794 and preceding abstract].

Observations suggested that *Bact. ananas* enters the pineapple fruitlets during development through decaying floral parts, mechanical cracks which are generally present in large fruits, and ruptured fissures running from the eye cavity into the placental lobes. The fact that

individual plants remained healthy till maturity in spite of having been profusely sprayed with suspensions of the bacterium would suggest that such plants are very resistant to, if not immune from, the disease.

SERRANO (F. B.). **Pineapple mealy-bug wilt in the Philippines.**—*Philipp. J. Sci.*, lv, 4, pp. 363–377, 5 pl., 1934.

The main point of interest in this paper is an account of artificial colonization experiments on Smooth Cayenne pineapple plants, the results of which conclusively proved that the pineapple mealy bug (*Pseudococcus brevipes*) is the primary and true cause of mealy bug wilt in the Philippines, which appears to be identical with that reported from Haiti and Hawaii [see above, p. 455]. The author considers that the insect evidently secretes a non-living toxic principle which causes the wilting of the host, producing typical wilt symptoms in about two months. He also distinguishes the slow and quick types of the disease noticed by Carter [*R.A.M.*, xii, p. 520], as well as the green spotting described by the latter in some cases [loc. cit. and ibid., xiii, p. 586]; this last symptom was shown not to be an important characteristic of wilt (although it is very common in cases of quick wilt), and to be produced by a grey strain of the insect, while another pink strain only causes chlorotic spots that are characteristic of both types of wilt, and is more commonly associated with the slow wilt.

The abundance and general vigour of the mealy bug colonies appeared to be greatly favoured in the field by the co-operation of two species of ants, namely, *Pheidole megacephala* and *Solenopsis geminata*.

LEWCOCK (H. K.). **Pineapple wilt disease and its control.**—*Qd. agric. J.*, xliii, 1, pp. 9–17, 2 figs., 1935.

This is a semi-popular account of the serious wilt caused in Queensland by the parasitic activity of *Phytophthora cinnamomi* and other fungi on the roots of the pineapple, the symptoms of which are briefly described [*R.A.M.*, viii, p. 53; xiii, p. 215]. The disease must be distinguished from a somewhat similar condition of the host due to nematodes (*Heterodera marionii*) or white grubs (*Lepidiota* spp.), either or both of which may be associated with it. The mealy bug (*Pseudococcus brevipes*) wilt [see preceding abstract] is stated not to have been found as yet in Queensland. In the wilt disease caused by fungi the most striking symptom is the collapse of the foliage, which in the earlier stages turns a drab-olivaceous colour. If the fruit has not formed its development is arrested and it colours prematurely, the stalk withering for some inches below the base of the fruit though not enough to cause the latter to collapse. The roots of affected plants are rotted, often in advance of any foliage symptoms, and in advanced stages the plant may be very easily pulled out. The disease starts in late winter or early spring and develops in the summer, new lands becoming infected after a few years. The attacks are sporadic but may be widespread in favourable seasons. Heavy rainfall favours the disease, especially as many of the pineapple soils are relatively impervious and readily waterlogged. Surface erosion also conduces to the disease by weakening the root system and denuding the soil of organic matter, soils containing less than 3 per cent. of which are unsuited to the plant. Soil reaction is also

important, as the disease has not been observed in soil more acid than P_H 5·1, whereas the optimum growth of the host is found locally in soils from P_H 4·5 to 5.

Suggestions based on these considerations are given for the control of the disease, especially by endeavouring to adjust the soil reaction to P_H 5 or below, as by a single application of 600 or 700 lb. sulphur in the less acid coastal districts. Good drainage is equally important and organic material should be plentifully supplied.

Lewcock (H. K.). **Top rot of Pineapples and its control.**—*Qd. agric. J.*, xliii, 2, pp. 145–149, 1 pl., 1935.

Pineapple heart or top rot in Queensland is associated with *Phytophthora cinnamomi* alone of the species of this genus found in the similar disease in Hawaii [*R.A.M.*, xiii, p. 527; xiv, p. 194] and is becoming increasingly prevalent. It usually attacks plants before they have fruited. Shortly after infection, the central leaves turn drab olivaceous-green to red, dry out rapidly, and curl back along the edges, eventually showing a characteristic smoky-brown appearance before they disintegrate and fall to the ground. The outer leaves may remain apparently normal until the disease is well advanced. A slight pull detaches the terminal crown of leaves from the stem even before the foliage symptoms have become well defined, this being a useful means of diagnosis in the early stages. The bases of the affected leaves develop a malodorous, putty-coloured, rotted area sharply demarcated from the upper green part by a distinct brown margin. The apex of the stem shows a similar rot, also characterized by a well-defined brown margin, but the infection does not usually spread to the woody tissue of the rootstock.

The fungus enters through fresh cuts or injuries, decaying roots, or the tender apical stem tissues. When the roots alone are infected a wilt disease is produced [see preceding abstract] and this sometimes continues up into the stem and leads to top rot, the early sporadic infections of which are frequently thus initiated. Under favourable conditions of moisture and temperature, spores from these first diseased plants are disseminated to healthy plants by the movements of surface water or heavy rain. *P. cinnamomi* can survive in the soil for a considerable time, and being actively parasitic on pineapple roots is likely to reappear indefinitely once the soil has become infected.

Top rot losses occur chiefly in winter and spring. Usually, certain parts of a plantation show a high incidence of the disease, while the remainder may be almost unaffected; losses of 50 to 60 per cent. have occurred. The prevalence and severity of infection are largely determined by environmental conditions. In Queensland serious losses are caused only in exceptionally rainy seasons, and even then epidemics are confined to badly drained localities and districts liable to flooding. Plants propagated from tops or slips, their loose, open structure rendering the heart tissues liable to pollution by flood water, are more readily infected than those grown from suckers.

No special control measures, except the prompt removal and destruction of diseased plants, are necessary in hilly, well-drained areas. Elsewhere, the suckers or slips should be planted on low ridges; plantings

in flat country must not be made in trenches. Planting material intended for old land where outbreaks have already occurred should be treated with Bordeaux mixture by the Hawaiian method [loc. cit.].

Tims (E. C.). **A Stilbum disease of Fig in Louisiana.**—*Phytopathology*, xxv, 2, pp. 208–222, 2 figs., 1935.

Most of the information contained in this paper on the fig (*Ficus carica*) disease caused by *Stilbum cinnabarinum* in Louisiana has already been summarized [*R.A.M.*, xiii, p. 789], but the present expanded account comprises a review of the relevant literature, a bibliography of thirty-six titles, and observations on the morphology of the fungus. A genetic connexion was traced both in nature and in culture between the conidial (*Stilbum*) and the associated ascigerous stage *Megalonectria pseudotrichia* (Schw.) Speg. The bright red perithecia of the latter measure 475 to 525 μ in diameter when fresh, and are occupied by asci 80 to 130 by 16 to 20 μ (average 100 by 17 μ), containing eight hyaline, muriform ascospores, 20 to 40 by 9 to 14 μ, with 5 to 7 transverse septa.

Jenkins (Anna E.). **Sphaceloma perseae the cause of Avocado scab.**—*J. agric. Res.*, xlix, 10, pp. 859–869, 4 pl. (1 col.), 1934.

This is a full report of the author's cultural and pathogenicity studies of *Sphaceloma perseae* [*R.A.M.*, xiii, p. 386] on avocado (*Persea americana*) [*P. gratissima*], including an English technical description of the fungus. The results showed that in Florida the avocado varieties Challenge, Perfecto, and Surprise, of the Guatemalan race, are susceptible to infection with *S. perseae*, in addition to the varieties which were already known to be highly susceptible there, namely, Fuerte and Lulu (Mexican-Guatemalan hybrids), Trapp (West Indian race), and Taylor (Guatemalan race). In Cuba and Porto Rico native avocado varieties are stated to be rarely attacked, while in Brazil scab in severe form was only observed on avocados originally from Florida but not on the native varieties. The occurrence of the fungus in Rhodesia [loc. cit.] is stated not to have been verified so far. Cross-inoculation experiments indicated that *S. perseae* is not pathogenic to citrus and that *S. fawcettii* [loc. cit.] does not attack avocados.

Wilson (J. D.) & Runnels (H. A.). **Transpirational response of various plants to Bordeaux mixture.**—*Bi-m. Bull. Ohio agric. Exp. Sta.* 171, pp. 198–202, 1934. [Abs. in *Exp. Sta. Rec.*, lxxii, 4, pp. 490–491, 1935.]

When forty-one different species of plants were sprayed under greenhouse conditions with Bordeaux mixture (6–4–50) the nightly increase in the transpiration rate (7 P.M. to 7 A.M.) ranged from 8 per cent. for celery to 375 per cent. for *Coleus* and the total 24-hour increase from —2 per cent. for stocks [*Matthiola incana*] to 33 per cent. for cucumber. In the unsprayed plants the percentage of nightly water loss ranged from 4 per cent. for beets and peppers [*Capsicum annuum*] to 37 per cent. for celery. In the outdoor test the transpiration increases due to spraying ranged from 104 per cent. for maize and beans to 121 per cent. for hollyhocks in soil containing about 50 per cent. of its water-holding

capacity, and from 91 per cent. for maize to 116 per cent. for tomatoes on soil containing about 30 per cent. moisture. In the drier soil the sprayed plants wilted more severely than the controls, and leaf-burning was occasionally severe enough to reduce the transpiration capacity [*R.A.M.*, xii, p. 459].

NEWHALL (A. G.). **Theory and practice of soil sterilization.**—*Agric. Engng, St. Joseph, Mich.*, xvi, 2, pp. 65–70, 5 figs., 3 graphs, 1935.

Soil sterilization for the control of fungal, bacterial, insect, and nematode pathogens of vegetables and ornamentals in the United States is discussed from the theoretical and practical standpoints under the headings of chemical disinfection, steam sterilization methods, and electric soil sterilization [cf. *R.A.M.*, xii, p. 42].

All the chemicals so far tested for the purpose in view, including formaldehyde (the cost of which is estimated at about 1 cent per sq. ft.), glacial acetic acid, carbon bisulphide, and mercuric chloride or other mercury compounds are open to various objections, and steam sterilization is considered to be preferable for durable results. Three methods of steam sterilization are now in use, viz., the buried perforated pipe, steam pan, and buried tile systems. By the first method the soil is sterilized from 3 to 6 in. deeper than by the pan system in about the same time, but rather more fuel is consumed. With the pan system partial sterilization is obtained at a depth of 5 to 10 in., and 2·7 sq. ft. per hour per boiler h.p. can be treated at a cost of 0·6 to 1·2 cents per sq. ft. The buried tile system is more effective and of greater permanency than either of the others. The annual charge of steaming, reckoning interest on the installation and the cost of fuel, comes to some $500 per acre. Buried tiles have been in use for 15 to 18 years compared with two to six for the other systems under discussion.

Electric soil sterilization is still in the experimental stage but the outlook for its extension is regarded as promising. In preliminary tests at the Cornell Agricultural Experiment Station in 1934 it was found that most soil pathogens succumb to temperatures considerably below the boiling point of water. The cost of the treatment has been estimated to range from 3 to 6 cents per cu. ft.

SENNER (A. H.). **Application of steam in the sterilization of soils.**—*Tech. Bull. U.S. Dep. Agric.* 443, 19 pp., 2 diags., 3 graphs, 1934. [Received May, 1935.]

After a brief description of the four most common methods of steam sterilization of soil in the greenhouse [the three mentioned in the preceding abstract and the steam rake or harrow], the author gives some details of limited tests conducted with the main purpose of determining the effect of initial steam pressure on the final moisture content and temperature of the soil, and the quantity of steam needed per surface unit. The results indicated that the moisture content is increased during sterilization but is not materially affected by variations of steam pressure, and that soil temperatures in excess of about 212° F. can only be obtained by using superheated steam. The paper also contains some practical advice concerning the lay-out of steam-sterilization plants.

Morstatt (H.). **Die jährlichen Ernteverluste durch Pflanzenkrankheiten und -schädlinge.** [The annual yield reductions through plant diseases and pests.]—*Kranke Pflanze*, xii, 2, pp. 17–19, 1935.

Some figures are given to illustrate the extent of the annual losses sustained in Germany through plant diseases and pests, amounting on an average to RM. 2,000,000,000 [*R.A.M.*, viii, p. 455]. At an extremely conservative estimate, diseases are responsible for a reduction of 10·8 per cent. (RM. 860,000,000) in the aggregate yield of the principal cultivated crops—cereals, potatoes, sugar beets, vegetables, fruit, and vines —valued at RM. 6,500,000,000. Professor Appel has calculated that at least a quarter of these immense losses could be saved by judicious plant protection propaganda, while other experts believe that within a few years the damage might be reduced to half its present amount by properly organized control measures.

Brooks (C.). **Some botanical aspects of perishable food products.**—*Sci. Mon., N.Y.*, xl, 2, pp. 122–137, 6 figs., 4 graphs, 1935.

Some interesting observations, supported by statistical data and citations from the literature, are made on various physiological, biochemical, and pathological aspects of the storage of perishable foods, and on recent developments and improvements in this field in various countries. Most of the later work referred to has been noticed in this *Review*. In connexion with some figures of losses in goods of this category [cf. *R.A.M.*, xiii, p. 176], it is stated that the total claims paid by the American railways on freight shipments of fresh fruits and vegetables in 1932 was $7,203,145, almost equalling the sum paid on all other commodities, though representing only 3 per cent. of the total cars handled. These figures do not include the losses in transport other than by rail, in storage, or in the wholesale and retail markets. Tomatoes suffered the most extensive damage on the railways, the claims per car in respect of this product averaging $24·89, followed by lettuce ($19·44), carrots ($18·35), and watermelons ($17·24); the corresponding figures for oranges, apples, onions, and potatoes (sweet and white) were only $6·20, 5·88, 4·37, 3·27, and 1·05, respectively.

Meier (F. C.) & Lindbergh (C. A.). **Collecting micro-organisms from the Arctic atmosphere.**—*Sci. Mon., N.Y.*, xl, 1, pp. 5–20, 10 figs., 2 maps, 1935.

This is an expanded account of the writers' collaborative studies on the micro-organisms of the Arctic atmosphere, a note on which has already appeared [*R.A.M.*, xiv, p. 384]. The second-named writer was responsible for the special device [which is fully described and figured], known as a 'sky hook', used for catching the spores, and also supplied field notes and maps. The species of fungi represented in the collection have been tentatively assigned to the genera *Macrosporium*, *Cladosporium*, *Leptosphaeria*, *Mycosphaerella*, *Trichothecium*, *Helicosporium*, *Uromyces*, *Camarosporium*, and *Venturia*.

Wiltshire (S. P.). **Some further notes on the preservation of Petri dish cultures.**—*Trans. Brit. mycol. Soc.*, xix, 3, pp. 259–260, 1935.

In this brief note the author describes some modifications of the

method suggested by him for the indefinite preservation of Petri dish fungal cultures [*R.A.M.*, x, p. 257], designed for the improvement of the adherence of old cultures to the wax, and also to facilitate the transfer of the cultures from the dish to the drying disk.

ATANASOFF (D.). **Old and new virus diseases of trees and shrubs.**—*Phytopath. Z.*, viii, 2, pp. 197–223, 17 figs., 1935.

This account of some relatively unfamiliar virus diseases of trees and shrubs is preceded by a brief review of old records of the subject, from which it would appear that a condition evidently allied to bitter pit of apples [*R.A.M.*, xiv, pp. 316, 369] attracted attention [? in England] as early as the middle of the twelfth century, while the infectious nature of jasmine chlorosis (first observed in Bulgaria in 1934) [ibid., vii, p. 386] was recognized towards the close of the seventeenth.

The following are among the disorders investigated by the writer in Bulgaria: mosaic of Canadian poplar (*Populus balsamifera*), hazel nut (*Corylus*) [*avellana*], elm, fig [ibid., xiv, p. 252], maple (*Acer negundo*), *Cornus mas*, ash, and lilac (on which the symptoms resemble the graft blight described by Chester from the United States) [ibid., x, p. 599], the last-named also contracting a form of ring spot; infectious variegation of *Laburnum vulgare*; and witches' broom of *Robinia pseud-acacia* [ibid., xii, p. 405], which is also liable to a foliar mottling and deformation similarly affecting *Gleditschia triacanthos*. In connexion with a discussion on mulberry 'dwarf' or 'curl' ('ishikubyo' or 'shikuyobyo') in Japan and Central Asia [ibid., xi, p. 756], mention is made of Ichitkawa's comparison of the disease in 1896 (*Bot. Mag., Tokyo*, ix, p. 82) with peach yellows [ibid., xiv, p. 219]. Notes are also given on various other disturbances known or suspected to be of virus origin [to most of which reference has been made from time to time in this *Review*], and a bibliography of seventy-six titles is appended.

MCLENNAN (E[THEL] I.). **Non-symbiotic development of seedlings of Epacris impressa Labill.**—*New Phytol.*, xxxiv, 1, pp. 55–63, 1 pl., 4 figs., 1935.

The presence of an endotrophic mycorrhizal fungus, closely resembling that associated in Europe with the Ericaceae, has been reported by H. C. Baron (in an unpublished thesis) in the roots of *Epacris impressa*, a member of the nearly allied family of Epacridaceae, in Australia. In contrast to *Calluna vulgaris*, however, the aerial organs of *E. impressa* have shown no trace of infection. Seedlings of the latter were raised asymbiotically by the writer and Baron on nutrient agar gels and on sterile sand moistened with Miss Rayner's nutrient solution A [*R.A.M.*, x, p. 496]. The plantlets on agar developed no roots but were grown in the laboratory for three years and formed healthy green shoots, absorption of nutrients apparently taking place through the hypocotyl. Those on sand with the nutrient solution made normal growth and developed a fair root system which was free from mycorrhizal infection. It is apparent from these results that the decisive factor in the development or non-development of the roots was the physical or chemical character of the medium, the gel being impenetrable by the fine rootlets whereas no arresting action was exercised

by the sand. It follows, therefore, that the absence of a root system is in no way contingent on failure of association with the appropriate mycorrhizal form [cf. ibid., xiv, p. 247].

PEYRONEL (B.). **Il sapore e alcune reazioni microchimiche delle micorrize ectotrofiche prodotte da Russule e Lattarii.** [The flavour and some microchemical reactions of the ectotrophic mycorrhiza produced by species of *Russula* and *Lactarius*.]—*Nuovo G. bot. ital.*, N.S., xli, 4, pp. 744–746, 1934.

The author has found that not only are there structural similarities between the mycorrhizal mantles produced by species of *Lactarius* and *Russula* [which are listed] on beech, birch, and larch [*R.A.M.*, i, p. 306] and their corresponding hymenophores, but also that there is a similarity of flavour. The mycorrhiza produced by species with a pungent flavour were also pungent, while those produced by non-pungent species were sweet. The mycelial mantle in the mycorrhiza produced by *Russula* spp. showed certain characteristic colour reactions similar to those of the cystidia and laticiferous vessels of the hymenophores.

SNELL (K.). **Die Bewertung der Sorten von Kulturpflanzen nach ihrer Widerstandsfähigkeit gegen Krankheiten.** [The varietal evaluation of cultivated plants by their resistance towards diseases.]—*NachrBl. dtsch. PflSchDienst*, xv, 2, pp. 13–14, 1935.

The general principles of breeding for resistance to disease in cultivated plants are briefly illustrated by means of some familiar examples [attention to which has frequently been drawn in this *Review*]. Up to the present these principles have found a wide practical application in Germany only in the case of potato wart [*Synchytrium endobioticum*: see below, p. 465], involving the annual testing at the Biological Institute, Berlin-Dahlem, of some 10,000 seedlings for their reaction to this disease [cf. ibid., xiv, p. 400], but there is every prospect of an extension of the work in other fields.

ALLEN (M. C.) & HAENSELER (C. M.). **Antagonistic action of Trichoderma on Rhizoctonia and other soil fungi.**—*Phytopathology*, xxv, 2, pp. 244–252, 1935.

An extended account, supplemented by tables, is given of the experiments briefly described in a preliminary note by the second-named writer on the antagonism of *Trichoderma* (?) *lignorum* to *Rhizoctonia* [*Corticium*] *solani* and *Pythium de Baryanum* causing seed decay and damping-off of cucumbers [*R.A.M.*, xiv, pp. 53, 248]. A similar but less marked response is stated to have been obtained with garden peas attacked by *C. solani*. The filtrate from a five-day-old culture of *T. lignorum* was found to be lethal to *C. solani* at full strength or at dilutions not exceeding 40 per cent. Ten minutes' heating at 100° C. completely inactivated the toxic principle in the filtrate, while the same period at 90° or 80° reduced its virulence considerably and slightly, respectively. Similar results were obtained by bubbling oxygen through the filtrate in cotton-plugged test-tubes for twenty days at room temperature. *C. solani* made no growth in a freshly prepared, sterilized, five-day-old *Trichoderma* filtrate, but developed profusely in a similar

filtrate the toxicity of which was destroyed by the above-mentioned treatments.

Reid (R. D.). **Some properties of a bacterial-inhibitory substance produced by a mold.**—*J. Bact.*, xxix, 2, pp. 215–221, 1935.

The salient features of this study on the properties of a bacterial-inhibitory substance produced by a *Penicillium* closely allied to *P. notatum* (*P. chrysogenum* group) have already been noticed [*R.A.M.*, xii, p. 387].

Michaelis (P.). **Entwicklungsgeschichtlich-genetische Untersuchungen an Epilobium. IV. Der Einfluss des Plasmons auf Verzweigung und Pilzresistenz.** [Evolutionary and genetical investigations on *Epilobium*. IV. The influence of the plasmon on branching and fungal resistance.]—*Ber. dtsch. bot. Ges.*, liii, 1, pp. 143–150, 3 figs., 1935.

In continuance of his studies on the influence of the plasmon [cytoplasm of the egg-cell] on the inheritance of characters by the nuclear genes [genom] the author compared the behaviour of *Epilobium hirsutum* plants with *E. luteum* × *E. hirsutum* hybrids repeatedly back-crossed with *E. hirsutum* pollen. Marked differences in reaction to infection by *Erysiphe* sp. were observed between the parent species in experimental pots, *Epilobium hirsutum* being heavily attacked and *E. luteum* immune. The former were so severely infected that in many cases the leaves of the lower whorl were destroyed. The axillary shoots developing subsequent to infection were misshapen and bore only stunted leaves. In the F_{11} progeny of the back-crosses, which resembled the *E. hirsutum* plants but had *E. luteum* plasmon, the attack of mildew was very much milder, and caused only slight injury.

Ashworth (Dorothy). **The receptive hyphae of the rust fungi.**—*Ann. Bot., Lond.*, xlix, 193, pp. 95–108, 5 figs., 1935.

The author's histological studies of material of the following rusts, namely, *Coleosporium tussilaginis*, *Endophyllum sempervivi*, *Melampsora larici-caprearum*, *M. larici-populina*, *Melampsoridium betulinum*, *Phragmidium violaceum*, and *Puccinia malvacearum*, showed that in these rusts emergent hyphae of the stomatal and intercellular types are of frequent occurrence, and that their development is not confined to spermogonia and aecidia, since they may occur together with other spore forms and also in the rusts that do not form aecidia and spermogonia. A discussion of the significance of these observations is left for later publication.

Köck (G.) & Greisenegger (K.). **Tätigkeitsbericht des Kartoffel-Fachausschusses über das Jahr 1934.** [Report on the work of the Potato Expert Committee for the year 1934.]—*Neuheiten PflSch.*, xxviii, 1, pp. 4–6, 1935.

A summarized account is given of the activities of the Austrian Potato Expert Committee in 1934. To the eight types of potato viruses previously recognized in Austria was added a hitherto unobserved form of mosaic-crinkle found at Petzenkirchen.

A considerable extension of wart disease [*Synchytrium endobioticum*]

was recorded from Styria [ibid., xiii, p. 322]. The encouraging results given by the 1933 experiments in the control of this disorder on the susceptible Wohltmann variety by soil applications of sulphur were partially maintained in 1934 in respect of freedom from infection, but the growth of the plants was adversely affected by the more efficacious treatments with 600, 800, or 1,000 gm. per sq. m.

Three applications of 1 per cent. Bordeaux mixture at the beginning of July, August, and September successfully controlled *Phytophthora* [*infestans*] on the Hindenburg and Alma varieties.

HENRY (A. W.). **Common Potato diseases and their control.**—*Circ. Coll. Agric. Alberta* 15, 25 pp., 8 figs., 1934. [Received April, 1935.]

Popular notes are given on the occurrence and control of some well-known fungal and virus diseases of potatoes in Alberta, Canada.

KAHO (H.). **Zur Physiologie der Kartoffel. I. Über die Permeabilität des Knollengewebes der vitalen und der abbaukranken Kartoffeln.** [Contribution to the physiology of the Potato. I. On the permeability of the tuber tissue of sound and degenerate Potatoes.]—*Phytopath. Z.*, viii, 2, pp. 157–164, 1935.

In order to determine the comparative permeability of the protoplasm of healthy potato tubers and those suffering from 'degeneration' in Esthonia in the form of mosaic, crinkle, and leaf roll, excised disks of tissue were laid in distilled water for given periods (up to 15 hours in the case of freshly dug material), at the end of which the exosmosis of the electrolytes was measured by electrical conductivity. The measurements showed that this exosmosis was generally greater in the diseased than in the healthy tubers. It was further shown by the so-called 'tissue tension method', involving the contraction of strips of tissue in a hypertonic solution, e.g., of saccharose (0·55 mol.) or calcium nitrate (0·28 mol.), that the cells of the diseased tubers have lower osmotic values than those of healthy ones [cf. *R.A.M.*, xi, p. 743]. From the response of the tissue strips to re-expansion in water it may be inferred that the cells of diseased tubers are more permeable to water than those of healthy ones.

BLACK (W.). **Studies on the inheritance of resistance to wart disease (Synchytrium endobioticum (Schilb.) Perc.) in Potatoes.**—*J. Genet.*, xxx, 1, pp. 127–146, 1935.

After a brief review of the literature dealing with inheritance of resistance in potatoes to wart disease (*Synchytrium endobioticum*), with particular reference to Lunden's and Jørstad's recent communication [*R.A.M.*, xiv, p. 251], the author gives a full tabulated account of his studies in Scotland on this problem since 1927. His results, with those reported by other workers, lead him to conclude that there are various kinds of resistant or tolerant and susceptible varieties, the differences being due to physiological properties governed by definite hereditary factors. The factors for resistance may not all possess similar powers and consequently do not contribute equally towards the natural resistance of a variety. Reaction to wart disease is believed to be explicable

on a more simple factorial basis than that assumed by other workers, and a three-factor scheme is presented which appears adequately to explain the observed facts. It is suggested that the reaction is controlled by three factor pairs, resistance being induced in the plant by the cumulative interaction of three factors designated A, B, C. Each of these is given a numerical value: A = 1, B = 2, and C = 3, which represents approximately their relative contributing power towards resistance. Sufficient resistance to overcome infection under field conditions is induced in plants in which the sum of the factorial values is seven or over. A plant heterozygous for all three factors is susceptible, the sum of its factorial values being only six. The numerical values assigned to genotypes correspond to phenotypic reaction in such a manner that the higher the value the more resistant is the phenotype.

A schedule is given showing the hypothetical genotypic constitution of resistant and susceptible varieties, together with the theoretical ratios in which these varieties should segregate when self-fertilized. This is followed by tables showing the actual segregations obtained from the self-fertilization of resistant and of susceptible potato varieties, together with the theoretical and expected ratios, from which the probable factorial constitution of the varieties is worked out.

CHAMBERLAIN (E. E.). **Fungi present in the stem-end of Potato tubers.**—*N.Z. J. Sci. Tech.*, xvi, 4, pp. 242-246, 1935.

Among the 1,475 fungus cultures isolated on potato-dextrose agar from the vascular bundles at the stem-ends of 1,201 out of 1,761 potato tubers tested at the Plant Research Station, Palmerston North, New Zealand, were 266 of *Fusarium orthoceras* [*R.A.M.*, xiii, p. 537], 246 of *Verticillium albo-atrum*, 60 of *Oospora pustulans*, 8 of *Corticium vagum* [*C. solani*], 5 of *Colletotrichum atramentarium*, and 4 of *Coniosporium arundinis* [ibid., x, p. 242]. Inoculation experiments with a number of the organisms showed that only *V. albo-atrum* was capable of causing wilt [see next abstract], while a dry rot of the tubers was induced by *F. orthoceras* and an unidentified species of *Fusarium*.

Corticium solani is prevalent throughout the Dominion as a pathogen of growing potato shoots. *O. pustulans* is responsible for a skin spot in Southland and to some extent in Canterbury. *Colletotrichum atramentarium* may be involved in the premature death of plants in Auckland but seems to do little damage elsewhere. The relative predominance of the various fungi was found to be influenced by the place of cultivation.

CHAMBERLAIN (E. E.). **Verticillium-wilt of Potatoes: its appearance, cause, and effect on yield.**—*N.Z. J. Agric.*, l, 2, pp. 86–91, 4 figs., 1935.

Briefly describing the symptoms of potato wilt and the life-history of its causal organism (*Verticillium albo-atrum*) [see preceding abstract], the author states that the disease was first recorded in New Zealand in 1931 [*R.A.M.*, x, p. 706; xii, p. 719]; it is now present in every potato-growing district in the country, and annually causes heavy losses. The Aucklander Tall-top and Short-top varieties are very susceptible, over

30 per cent. infection having been observed on a crop of the former. In a test conducted at Palmerston North the disease reduced the yield by 50 per cent., and evidence was obtained that while all the tubers of an infected plant do not necessarily themselves become infected, the fungus may be present in tubers from apparently healthy plants which may have become infected through the soil late in the season.

Biraghi (A.). **Esperienze sulla formazione di sughero delle ferite in porzioni di tuberi di Patata irradiate con raggi ultra-violetti.** [Experiments on wound cork formation in portions of Potato tubers exposed to ultra-violet rays.]—*Boll. Staz. Pat. veg. Roma*, N.S., xiv, 4, pp. 492–502, 1 pl., 1934. [English summary.]

When cut halves of potato tubers were exposed to ultra-violet rays the superficial cells were killed, the necrosis being proportional to the duration of the exposure. When a conidial suspension of *Penicillium* sp. was placed on the cut surface of the exposed halves and of unexposed control halves, fungal growth was vigorous on the former and absent or scanty on the latter. Under the one or more layers of necrosed cells on the surfaces exposed to radiation there were a few layers of cells which did not form cork except when the fungus was added; under these were one or more layers in which phellogen was formed. The author gives reasons for holding that this deep cicatrization in irradiated uninoculated tubers is due to a change in the physiological balance of the constituents of the intermediate layers of cells between the necrosed layers and those that form cork.

Drechsler (C.). **Pythium scleroteichum n.sp. causing mottle necrosis of Sweetpotatoes.**—*J. agric. Res.*, xlix, 10, pp. 881–890, 2 pl., 1934.

In this paper the author gives a cultural and morphological description (with a Latin diagnosis) of *Pythium scleroteichum* (hitherto a *nomen nudum*) which, in a previous communication [*R.A.M.*, vi, p. 749], Harter & Whitney stated to be concerned, in association with *P. ultimum*, in the causation of mottle necrosis of sweet potatoes in the United States. In 1924, when mottle necrosis was more prevalent than usual in Maryland, Delaware, and Virginia, *P. ultimum* accounted for about 80 per cent. of the diseased specimens collected in Virginia, the rest yielding *P. scleroteichum* and an unidentified species of *Phytophthora* in about equal numbers. Since then, however, *P. scleroteichum* was found causing the disease alone in Virginia, Iowa, and Indiana.

In pure culture *P. scleroteichum* is characterized by a diffuse submerged mycelium consisting of hyphae mostly 2·5 to 7 μ broad, giving about 26 mm. radial growth in 24 hours at 24° C. Aerial mycelium is absent or scanty. The oogonia are terminal or (less frequently) intercalary, with a smooth wall 0·5 to 1·2 μ thick, subspherical, and 16 to 32 μ (average 23·8 μ) in diameter. The antheridia are regularly clavate, crooknecked, 9 to 16 by 4 to 7 μ, and usually 1 to 5 (average 3) to an oogonium; they are borne terminally or occasionally laterally on sometimes septate branches usually from a single, sometimes from two, parent hyphae, often constricted at intervals by abrupt, transverse furrows, and frequently, together with vegetative branches arising from them,

wrapped extensively and closely around the oogonium, making narrow or broad contact at the tip. They are mono- or diclinous. The oospores are distinctly yellowish, smooth, largely filling the oogonium, and measure 11 to 26 μ (average 18·7 μ) with a wall 0·8 to 1·4 μ thick. The zoosporangial stage of the fungus has not yet been obtained.

Bugnicourt (F.). **Principaux cryptogames parasites du Riz en Indochine et traitement à leur opposer.** [The principal cryptogamic parasites of Rice in Indo-China and the means of combating them.] —*Bull. écon. Indochine*, xxxvii, pp. 1320–1321, 1934.

The chief fungal parasites of rice in Indo-China are stated to be *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: *R.A.M.*, xiv, p. 221], *H. sigmoideum* [*Leptosphaeria salvinii*: ibid., xiv, p. 119], and *Brachysporium* sp. [ibid., xii, p. 146]. All may be effectively controlled by 24 hours' immersion of the seed-grain in 0·35 per cent. formaldehyde or 48 hours in a 0·2 per cent. solution.

Fukushi (T.). **Studies on the dwarf disease of Rice plant.**—*J. Fac. Agric. Hokkaido Univ.*, xxxvii, 2, pp. 41–164, 6 pl., 1 fig., 1934.

Much of the information in this comprehensive, fully tabulated account of rice dwarf in Japan has already been noticed from other sources [*R.A.M.*, xi, p. 324; xiii, pp. 261, 800], but attention may be drawn to the following new points. No inclusion bodies or micro-organisms of etiological significance, or visual evidence of the presence of the virus responsible for the disease, could be detected in the salivary glands, alimentary canal, egg follicles in the ovarian tubules, mycetome, or other organs of the viruliferous individuals of the insect vector, *Nephotettix apicalis* var. *cincticeps*. Infection is not transmissible through the soil or seed, nor could transmission be effected by mechanical inoculations with unfiltered juice of diseased plants or by means of leaf mutilation, while negative results were also given by the inoculation of healthy rice plants with the macerated tissues and body fluid of viruliferous leafhoppers.

It would appear that the eggs of the leafhopper are already infected at an early stage of their development in the ovaries and that some of the ova may escape infection. In most cases a period of 1 to 14 days is requisite after emergence from the egg before the newly hatched viruliferous nymphs can transmit infection, though certain individuals may be capable of doing so immediately on emergence. Further access to the virus is not usually necessary to maintain infectivity in the viruliferous nymphs throughout their entire adult life. The minimum period of feeding on a diseased plant required for the acquisition of the virus by a non-viruliferous leafhopper was found to be three days, but it was more freely absorbed in tests after 10 and after 50 days' feeding; certain individuals, however, still remained non-infective even after 50 or 70 days. The incubation period of the virus within the insect body apparently ranged from 10 to 40 days at 11° to 38° C.; in one case it was over two months at 14° to 32°.

Certain leafhoppers collected on *Astragalus sinicus* in rice-fields in the spring proved to be viruliferous, so that the virus apparently over-

winters in its insect vector, unless it can be definitely established that it survives in its various wild grass hosts or that *A. sinicus* harbours it during the winter without manifesting any signs of disease. All the evidence at present available indicates that the rice dwarf virus is autonomous, multiplying both in the insect body and in the plant tissues, and is in all probability a living entity of ultramicroscopic dimensions [cf. ibid., xiii, p. 588].

A bibliography of 238 titles is appended.

Jacks (G. V.) & Scherbatoff (Miss H.). **Soil deficiencies and plant diseases.**—*Tech. Commun. Bur. Soil. Sci., Harpenden*, 31, 48 pp., 1934.

This publication is stated to be intended as a non-critical guide to the literature of the subject, and consists of a brief digest of the most relevant facts abstracted from several hundred English and foreign papers dealing with pathological conditions in plants ascribed to deficiencies of the soil in the so-called minor elements, manganese, iron, magnesium, boron, sulphur, copper, and zinc. Descriptions of the symptoms of the various diseases are included, and there is a bibliography of 367 titles.

Ziemiecka (Jadwiga). **The use of a modified Rossi-Cholodny technic for studying the organisms that decompose certain organic compounds in soil.**—*Zbl. Bakt.*, Abt. 2, xci, 16–21, pp. 379–394, 15 figs., 1935.

Satisfactory results in the investigation of the stimulatory influence of twelve organic substances on microbiological activity in Polish garden and arable soils were obtained by Conn's modification of the Rossi-Cholodny direct examination technique [*R.A.M.*, xii, p. 324; xiv, p. 392].

Edgerton (C. W.), Tims (E. C.), & Mills (P. J.). **Stubble deterioration of Sugar-Cane.**—*Bull. La Univ.* 256, 27 pp., 4 figs., 1934.

Deterioration of sugar-cane stubble (i.e. failure to produce a satisfactory number of vigorous ratoon shoots) has been one of the chief factors in the decline in the sugar industry in Louisiana, where it presents a more serious and complex problem than in the tropics because the cane is not harvested until winter has set in, so that the young shoots do not normally develop for several months. In addition to such factors as low temperature, poor drainage, and the like, red rot (*Colletotrichum falcatum*) has been found to be an important cause of this deterioration. The spores develop on the leaves and sometimes on the stalks, are washed down by the rains, and come into contact with the stubble pieces, which become infected in the nodal and bud regions and, to a slight extent, through the cut top surfaces. Many eyes are killed before they can germinate, and some of the shoots that emerge from the ground die off during the spring. The P.O.J. 213 and C.P. 807 varieties were found to be more susceptible to red rot than the other commercial varieties locally grown, and the former, together with P.O.J. 234, are

the two most seriously affected by stubble deterioration generally. The varieties at present commercially grown in Louisiana that have shown the greatest resistance to this trouble are Co. 281, Co. 29, and P.O.J. 36, while the new varieties C.P. 28–11, 28–19, and 29–320 also seem to be very resistant [cf. *R.A.M.*, xiii, p. 728].

McMartin (A.). **The Pineapple disease of Sugar Cane cuttings.**—*S. Afr. Sug. J.*, xix, 2, pp. 88–89, 1 fig., 1935.

A popular note is given on the pineapple disease of sugar-cane (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [*R.A.M.*, x, p. 777], the occurrence of which in Natal has recently been detected.

Sydow (H.) & Mitter (J. H.). **Fungi indici—II.** [Indian fungi—II.]—*Ann. mycol., Berl.*, xxxiii, 1–2, pp. 46–71, 1935.

This second annotated list of 75 Indian fungi [cf. *R.A.M.*, xii, p. 395], containing 2 new genera and 17 new species furnished with Latin diagnoses, consists mainly of rusts and Ascomycetes with some Fungi Imperfecti. The records include *Mycosphaerella brassicicola* on cabbage leaves [ibid., xi, p. 558]; *Phomopsis artocarpi* n.sp., with slightly depressed-globose or often irregular, grey- to olivaceous-brown, epiphyllous pycnidia, 100 to 185 μ in diameter, and simple, subulate to lageniform conidiophores, 5 to 9 by 2 to 3 or 1 μ (base and apex, respectively), bearing copious oblong, subfusoid or clavate, inaequilateral or slightly curved, continuous, yellowish-pink (in the mass) conidia, 5 to 8 (occasionally 10) by 1·6 to 2·5 μ, producing scattered, amphigenous, irregular, chestnut-brown spots, 5 to 20 mm. in diameter, on the leaves of *Artocarpus integrifolia*; *Diplodia hibiscina* var. *sabdariffae* Sacc. on *Hibiscus sabdariffa* stems; and *Cercoseptoria balsaminae* n.sp., with small caespituli formed in and under the epidermis, 30 to 60 μ in diameter, erumpent, and bearing filiform, curved or occasionally suberect, hyaline, indistinctly septate conidia, 35 to 100 by 1·5 to 2·5 μ (at the base) on parallel rows of subulate to filiform, hyaline or subhyaline conidiophores, 6 to 12 by 2·5 to 3 μ (at the base); the fungus forms sparse, dirty yellowish-brown spots, 0·5 to 1 cm. in diameter, on *Impatiens balsamina* foliage.

Sydow (H.). **Fungi venezuelani—Additamentum.** [An addition to Venezuelan fungi.]—*Ann. mycol., Berl.*, xxxiii, 1–2, pp. 85–100, 1 fig., 1935.

Continuing his taxonomic studies on the fungi of Venezuela [cf. *R.A.M.*, ix, p. 684], the writer here enumerates a further 16, including 4 new genera and 8 new species with German and Latin diagnoses. Special interest attaches to *Scleroconium venezuelanum* n.g., n.sp., producing irregularly scattered, hypophyllous, more or less spherical, greyish-green tubercles, 1 to 3 mm. in diameter, on living leaves of *Xanthosoma sagittifolia*. The taxonomic position of this fungus is obscure; it is presumably a parasite, deriving nutriment from the faintly discernible hyphae in the mesophyll. A superficial tubercle is formed on the leaf surface by an outgrowth of the fungus (possibly through the stomata) and is composed of reticulately branched, hyaline hyphae,

2 to 4 μ in diameter and producing abundant clusters of botryose conidia, 5 to 7 by 3 to 4 μ, sessile or possibly on short sterigmata.

Van Beyma Thoe Kingma (F. H.). **Beschreibung einiger neuer Pilzarten aus dem Centraalbureau voor Schimmelcultures Baarn (Holland). III. Mitteilung.** [Description of some new species of fungi from the Centraalbureau voor Schimmelcultures, Baarn (Holland). Note III.]—*Zbl. Bakt.*, Abt. 2, xci, 16–21, pp. 345–355, 7 figs., 1935.

Morphological and cultural particulars and Latin diagnoses are given of the following new species of fungi identified by the writer at the Centralbureau voor Schimmelcultures [cf. *R.A.M.*, xiii, p. 333]; *Ceratostomella major* n.sp. from the air in the Unilever factory, Rotterdam; *Margarinomyces atrovirens* n.sp. (together with *M. bubáki*) [ibid., x, p. 107] from black spots in margarine (Unilever); *Isaria cretacea* n.sp. from a packet of yeast kept for some time under damp conditions in England; *Penicillium velutinum* n.sp. from sputum; and *Scopulariopsis nicotianae* n.sp. from a dried Nyasaland tobacco leaf received from Bristol.

Săvulescu (T.) & Rayss (T.). **Quatrième contribution à la connaissance des Péronosporacées de Roumanie.** [Fourth contribution to the knowledge of the Peronosporaceae of Rumania.]—*Ann. mycol., Berl.*, xxxiii, 1–2, pp. 1–21, 10 figs., 8 graphs, 1935.

A list, supplemented by tables and by taxonomic and geographical notes, is given of 27 species of Peronosporaceae not included in foregoing compilations of this family in Rumania [cf. *R.A.M.*, xiii, p. 473], of which 6 are new and furnished with Latin diagnoses, bringing the present total for the country to 171 on 275 hosts.

Yamamoto (W.). **Cercospora-Arten aus Taiwan (Formosa) II.** [Species of *Cercospora* from Taiwan (Formosa) II.]—*J. Soc. trop. Agric. Taiwan*, vi, pp. 599–608, 4 figs., 1934.

Notes are given on 19 species (8 new, with Latin diagnoses) of *Cercospora* collected in Formosa during 1933–4 [cf. *R.A.M.*, xiii, p. 805]. Living leaves of *Althaea rosea* were attacked by *Cercospora althaeina* [ibid., xiv, p. 195], and those of *Eucalyptus globulus* by *C. epicoccoides*. *C. formosana* n.sp. is characterized by pale olivaceous, creeping, indistinctly septate hyphae, 2 to 3 μ in breadth, and simple, rarely sparsely branching, straight to subflexuous, continuous or 1- to 5-septate, brown conidiophores, 10 to 39 by 3·6 to 5 μ, bearing elongated to obclavate, straight or curved 3- to 15-septate, very faintly olivaceous conidia, 33 to 130 by 2 to 3·6 μ; it forms scattered, irregularly angular or suborbicular spots, 1 to 5 mm. in diameter, purplish-brown at first, paling gradually in the centre with a dark purple border, on living leaves of *Lantana mista* and *L. camara*. Living foliage of *Boehmeria frutescens* Thunb. var. *concoloris* Nakai develops irregularly scattered, angular, dark brownish or nearly black lesions, turning paler in the centre and becoming greyish-brown, 1 to 7 mm. in diameter, due to infection by *C. fukuii* n.sp., which is characterized by straight or subflexuous, pale olivaceous conidiophores, 16 to 62 by 3 to 4·3 μ, and cylindrical, nearly straight

or curved, very pale olivaceous, 3- to 14-septate conidia, 48 to 130 by 2 to 3 μ. *C. fukushiana* (Mats.) comb. nov. [ibid., viii, p. 447] forms irregularly scattered, orbicular or suborbicular, brown, later pale ochraceous or whitish, often brown- or red-bordered spots, 1 to 5 mm. in diameter, on living leaves of *Impatiens balsamina*; it is characterized by straight or flexuous, mostly simple, light brown conidiophores, 1- to 4-septate, 23 to 113 by 4·3 to 6 μ, and by acicular, sometimes elongated to obclavate, straight or slightly curved, 3- to 21-septate, hyaline conidia, 20 to 125 by 3 to 3·6 μ. Living *Dahlia variabilis* foliage is liable to infection by *C. grandissima* [ibid., vii, p. 765]. Large (5 to 30 mm. in diameter), orbicular or suborbicular lesions, yellowish- to dirty brown, turning grey or greyish-yellow, often surrounded by a yellowish-green, later dark purplish-brown zone, are formed on living leaves of *Ixora chinensis* by *C. ixorae* n.sp., which has densely aggregated, mostly simple, straight or sinuous, continuous or 1- to 4-septate, pale olivaceous-brown conidiophores, 16 to 46 by 3 to 4·3 μ, and cylindrical, 2- to 8-septate, very pale olivaceous conidia, 29 to 73 by 2 to 3 μ. Living lettuce foliage is attacked by *C. longissima* [ibid., ix, p. 230], and that of mango by *C. mangiferae*. *Nerium indicum* leaves are liable to infection by *C. nerii-indici* n.sp., producing subangular or irregular, yellowish-green, later yellowish-brown, ashen, or black-olivaceous, more or less effuse, often confluent lesions; the conidiophores are simple or branched, curved, denticulate above, 1- to pluriseptate, pale olivaceous-brown, and bear cylindrical or obclavate-cylindrical, straight or slightly curved, 1- to 11-septate, pale olivaceous conidia, 26 to 107 by 3 to 4·3 μ. Guava leaves are attacked by *C. sawadae* nom. nov. (= *C. psidii* Sawada (non Rangel) in Shirai & Hara: A list of Japanese Fungi, p. 72, 1927); and those of *Dioscorea alata* by *C. ubi* Rac.

Mitra (A.). **A study of certain Fusaria.**—*J. Indian bot. Soc.*, xiii, 4, pp. 255–268, 2 pl., 8 graphs, 1934.

Particulars are given of the writer's studies at Allahabad, India, on the comparative behaviour of six species of *Fusarium* on four standard media: *F. viride* (*F. solani* var. *medium*), newly reported as a parasite of potatoes [*R.A.M.*, xiii, p. 394] and experimentally shown to be pathogenic to apples, *F. camptoceras* isolated from *Pennisetum typhoideum*, and *F. moniliforme* [*Gibberella moniliformis*], isolated from a dead sorghum leaf sheath and proved capable of attacking apples [ibid., xiv, p. 242], made no better growth on media prepared from their own hosts than on the other substrata used. *F. diversisporum* and *F. incarnatum* (*F. semitectum* var. *majus*) produced little or no aerial mycelium on apple agar. Saltation in the form of sectors was observed in *F. solani* var. *medium* and *F. semitectum* from *Citrus medica* [loc. cit.], the mutants differing from their parents in linear rate of spread, aerial mycelium, coloration of the substratum, average septation, spore dimensions, and chlamydospore development. *F. solani* var. *medium* was the only species that produced both mycelial and conidial chlamydospores. The marked variability of the six forms studied, either as a response to cultural modifications or in the form of saltation, suggests that such temporary changes may be largely responsible for the great number of species recorded in the genus.

Van der Weij (H. G.). **Ziekten der Tabak. *Ex* Overzicht van de ziekten en plagen der Deli-Tabak in het jaar 1934.** [Tobacco diseases. *Ex* Report on the diseases and pests of Deli Tobacco in the year 1934.] —*Meded. Deli-Proefst.*, Ser. II, xci, pp. 4–11, 1935.

Very brief notes are given on the prevalence in Medan, Sumatra, during 1934 of the following parasitic diseases of tobacco: slime disease (*Bacterium solanacearum*), black rust (*Bacterium pseudozoogloeae*), top rot (*Bact.* [*Bacillus*] *aroideae*), *Phytophthora* [*parasitica*] *nicotianae* [*R.A.M.*, xii, p. 471], stem scorch (*Pythium*) [*aphanidermatum*, *P. myriotylum*, and *P. deliense*: ibid., xiii, p. 475], leaf scorch (*Cercospora nicotianae*), and the virus diseases mosaic ('peh sim'), Rotterdam B disease, 'gilah', 'korab', and 'daon lidah' [ibid., xiii, p. 328]. Some non-parasitic disorders are also mentioned.

Hoggan (Ismé A.). **Transmissibility by aphids of the Tobacco mosaic virus from different hosts.**—*J. agric. Res.*, xlix, 12, pp. 1135–1142, 1934.

In continuation of her studies of the transmission of virus diseases by aphids to tobacco [*R.A.M.*, xiii, p. 331], the author gives an account of experiments from 1930 to 1934, inclusive, in which she tested the transmissibility of Johnson's tobacco virus No. 1 [ibid., xiv, p. 261] by *Macrosiphum solanifolii* [*M. gei*], *Myzus persicae*, and *M. pseudosolani* from various Solanaceous and other hosts to tobacco. The results [which are tabulated] showed that the virus was transmitted with some regularity from tomato and *Lycopersicum pimpinellifolium*, but only occasionally from eight other hosts tested, while no evidence of transmission was obtained from the remainder. In general, the greatest amount of infection from any host was effected by *Macrosiphum gei*, and the least by *Myzus persicae*. Only two cases of transmission from tobacco to tobacco were obtained. In parallel tests comparatively high percentages of transmission of the cucumber mosaic virus [ibid., xiv, p. 143] to tobacco were obtained from all the hosts tested, including *L. pimpinellifolium*, *Solanum nigrum* var. *guineense*, *Nicandra physaloides*, *Physalis longifolia*, *P. heterophylla*, *Cynoglossum amabile*, *Zinnia elegans*, and *Phacelia whitlavia*, which are stated to be new records as hosts of the cucumber mosaic virus.

By using *Nicotiana tabacum* × *N. glutinosa* hybrids, which develop local necrotic lesions on the leaves at the points of infection with tobacco mosaic, it was estimated that with *Macrosiphum gei* about 1 aphid in 140, with *Myzus pseudosolani* 1 aphid in 129, and with *M. persicae* about 1 aphid in 800 or more is infective and able to introduce the virus into the host, while comparative experiments indicated that 1 *M. persicae* individual in 4 or 5 acted as a vector of a crucifer mosaic virus (an account of which is in the press), and transmitted sugar beet mosaic virus [ibid., xiv, p. 342] to tobacco.

The results of these investigations suggest that the more common aphids are probably not concerned in the dissemination to any appreciable amount of tobacco mosaic, except perhaps from the tomato, and it is doubtful whether even this can account for much of the sporadic infection which occurs on tobacco in the field.

Spencer (E. L.). **Effect of nitrogen supply on host susceptibility to virus infection.**—*Phytopathology*, xxv, 2, pp. 178–191, 2 figs., 3 graphs, 1935.

In a study of the effect of nitrogen supply on host susceptibility to virus infection, Turkish tobacco plants grown in soil at different nitrogen levels were inoculated with yellow tobacco mosaic virus (Johnson's tobacco virus 6) [*R.A.M.*, xiv, p. 385], susceptibility being measured by Holmes's pin puncture method [ibid., vii, p. 477; viii, p. 138]. *Nicotiana glutinosa* plants grown under similar conditions were inoculated with the ordinary green tobacco mosaic virus (Johnson's No. 1) [ibid., xiv, p. 261]. Early Golden Cluster beans (*Phaseolus vulgaris*) were grown at various nitrogen levels in sand cultures and inoculated by rubbing the leaves with the green tobacco mosaic virus, susceptibility being gauged by the average number of primary lesions per leaf.

Conclusive evidence was obtained from the three hosts of a definite correlation between plant nutrition and susceptibility to virus infection, the latter being governed not so much by host vigour as expressed in growth rate as by some other limiting factor of a nature so far unknown. However, plants making the most rapid growth were considerably less susceptible than those in which development was retarded by an excess of nitrogen. In tobacco the susceptibility of all the leaves on a plant is altered by changing the nitrogen level. At any nitrogen level the upper leaves are the most susceptible, followed by the middle ones.

Hopkins (J. C. F.). **Mycological notes. Seasonal notes on Tobacco diseases. 8. The mosaic mystery. 9. Danger points in field spraying.** —*Rhod. agric. J.*, xxxii, 2, pp. 108–113, 1935.

In the first note the author aims at dispelling the mystery which tends to enshroud the problem of tobacco mosaic in the mind of the Rhodesian tobacco-growers, and points out that the rather alarming amount of the disease which existed in some districts in 1934 was chiefly due to their ignoring or misinterpreting the recommendations for the control of the trouble published in 1931 by the Department of Agriculture [*R.A.M.*, xi, p. 206].

In the second note he gives some practical advice for the correct field spraying of tobacco with Bordeaux mixture, based on his recent recommendations [ibid., xiv, p. 200].

Ghimpu (V.). **Afecțiunile fiziologice ale Tutunului.** [Physiological disorders of Tobacco.]—*Bul. Cultiv. Ferment. Tutun.*, xxiii, 2, pp. 164–173, 1934.

A review is given of some of the more important recent literature on the physiological disorders of tobacco associated with excess or deficiency of the basic nutrient elements. Reference to most of the work referred to has been made from time to time in this *Review*.

Van Schreven (D. A.). **Uitwendige en inwendige symptomen van boriumgebrek bij Tomaat.** [External and internal symptoms of boron deficiency in Tomato.]—*Tijdschr. PlZiekt.*, xli, 1, pp. 1–26, 3 pl., 1935. [English summary.]

Using the same technique as already described in connexion with his

investigations on boron deficiency in tobacco [*R.A.M.*, xiii, p. 600], the writer carried out a series of observations on a similar phenomenon in Ailsa Craig tomato plants in water and glass-sand cultures [cf. ibid., xiv, p. 141]. The typical external and internal symptoms of the disorder, including death of the growing points of roots and stems, leading to secondary root and axillary bud production, leaf curl, chlorosis, thickening of the foliar tissue, and extensive degeneration of the cambium, phloem, and parenchyma, developed both in plants grown without boron and in those first supplied with an adequate quantity of boric acid and then deprived of it. The condition was found to be curable by the addition to the nutrient solution of 0·0005 gm. boric acid per l.

Tisdale (W. B.) & Hawkins (S.). **Control of Phoma rot of Tomatoes.** —*Pr. Bull. Fla agric. Exp. Sta.* 467, 2 pp., 1934.

After a very brief reference to the symptoms caused by *Phoma destructiva* [*R.A.M.*, xiv, p. 263] on tomatoes and to its economic importance in Florida, the authors state that the disease can be controlled by spraying with 2–2–50 Bordeaux mixture at intervals determined by weather conditions. This treatment should be supplemented, however, to prevent the development of fruit rot in stored tomatoes, by dipping the fruit, preferably immediately after picking, in a fungicide. Of the materials so far tested for this purpose, 5 per cent. borax solution, and a special, highly concentrated commercial mixture containing sulphur in the form of sodium polysulphides and sodium thiosulphates (sulfocide), at the rate of 1 gall. of the concentrate to 150 galls. water, have been found to be the most effective and not to injure the keeping qualities of the fruit. The borax treatment is more effective when the temperature of the solution is kept at 100° F. The addition of 2 lb. tar soap (liquid or in flakes) to 50 galls. of the solutions is recommended to increase their adhesive properties. This treatment was also shown to prevent a large percentage of decay in fruits from non-sprayed fields, but is less effective than a combination of spraying in the field and disinfection of the fruit after picking.

Raabe (A.) & Sengbusch (R. v.). **Zur Physiologie von Cladosporium fulvum.** [A contribution to the physiology of *Cladosporium fulvum*.] —*Gartenbauwiss.*, ix, 3, pp. 183–188, 2 figs., 1935.

M. Schmidt and his collaborators (including the second-named writer) are stated to have confused *Cladosporium fulvum*, the causal organism of tomato leaf mould [*R.A.M.*, xiii, p. 133], with *Trichothecium roseum*, a facultative parasite of all kinds of plant material which accompanied *C. fulvum* on the tomato leaves used. Their statements as to the influence of tomato decoction and solanin on germination and growth form of the germ-tubes are therefore applicable to *T. roseum* and not to *C. fulvum*. The latter was found to be readily cultivable on a medium consisting of 1 and 10 parts (by weight), respectively, of fresh tomato foliage and water, boiled for 5 to 10 minutes, and 2 per cent. agar, while biomalt agar (2·5 per cent.) also gave very satisfactory results. Slow growth and cushion-shaped, pale to olive-brown colonies are characteristic of *C. fulvum* on agar cultures. Conidiophores and conidia do not differ in any respect from those observed in nature. Inoculation

experiments with spore suspensions of the fungus from agar cultures gave positive results on Bonny Best tomato leaves.

Bavendamm (W.). **Bemerkenswerte pilzliche Krankheiten des letzten Jahres.** [Remarkable fungous diseases of the last year.]—*Mitt. dtsch. dendrol. Ges.*, xli (*Jb.*), pp. 180–181, 2 figs., 1934.

After a discussion of the pine disease caused by *Cenangium abietis* [*R.A.M.*, xii, p. 667], which is reported to have attacked especially 40- to 60-year-old stands with extreme severity in Germany during 1934, the author briefly describes the bark blight of oaks due to *Dothidea noxia* Ruhl. [ibid., viii, p. 347]. Affected trees show a brownish discoloration of the cortex, most pronounced near or surrounding branch stumps; the lesions, small at first, gradually expand until the whole branch or trunk, as the case may be, is girdled, and simultaneously extend longitudinally so that the upper part or even the whole tree is killed. Young trees (from 2 to 18 years old) are most liable to infection by *D. noxia*, the pycnidial stage of which, *Fusicoccum noxium*, is characterized by simple, hyaline conidia, 12·4 to 15 by 4 to 5·5 μ, and the perithecial form having hyaline ascospores measuring 18·6 to 22 by 4·5 to 6 μ. The fungus, a wound parasite, is capable of causing extensive damage and is not always amenable to control even by drastic pruning. Not only native but American red oaks (*Quercus rubra*) have been found susceptible to bark blight.

Clinton (G. P.) & McCormick (F[lorence] A.). **The Dutch Elm disease, Graphium ulmi, in Connecticut.**—*Science*, N.S., lxxxi, 2090, pp. 68–70, 1935.

Notes are given on the present distribution of Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) in Connecticut [*R.A.M.*, xiv, p. 406], where over 50 infected trees have been found, the majority in Fairfield County but one some 50 miles distant at Old Lyme. The European beetle carriers of the disease (*Scolytus scolytus*, *S. multistriatus*, and *S. sulcifrons*) were not detected near Old Lyme, but the native beetle *Hylurgopinus rufipes* and mites were found and shown to be capable of conveying the spores of the fungus [ibid., xiv, p. 63]. The writers believe that the time is now past when either the fungus or its insect carriers can be eradicated in the United States.

Ein Mittel gegen das Ulmensterben. [A remedy against the dying-off of Elms.]—*Öst. Vjschr. Forstw.*, N.F., liii, 1, pp. 12–13, 1935.

Writing recently in *Der deutsche Forstwirt*, Freiherr von Ascheberg reports an apparently complete cure of sixty-six elms suffering from dying-off [*Ceratostomella ulmi*] at Mersch [Westphalia], Germany [*R.A.M.*, xiv, p. 264], by means of injections of fruit-tree carbolineum [ibid., xiii, p. 316 *et passim*] applied through holes (four per tree) pierced obliquely through the bark to a depth of 10 cm. and at a height of 10 cm. above soil level, the treatments being given two years running in March–April and again in June–July.

Miller (P. W.). **Studies on the control of Walnut blight in Oregon.** — *Rep. Ore. hort. Soc. 1934*, pp. 105–121, 1935.

Further commercial spraying tests against walnut blight (*Bacterium juglandis*) [*R.A.M.*, xiv, p. 204] in grafted orchards confirmed the results obtained in previous experiments [ibid., xiii, p. 409], and indicated that at least two applications of Bordeaux mixture (2–2–50) are necessary to give satisfactory control in an average season in western Oregon. They should be made very shortly before most of the pistillate flowers come into full bloom and again after most of them have been pollinated, i.e., after about two weeks. A summer oil emulsion or a light medium spray oil may be added at the rate of 1 in 100 parts to the first application to reduce injury to the foliage. A third treatment about ten days after the second may be necessary if much rain falls during the month or six weeks after blossoming. The chief factor in the success or failure of this programme is the correct timing of the applications.

Miller (P. W.). **Walnut blight and its control in the Pacific Northwest.** —*Circ. U.S. Dep. Agric.* 331, 14 pp., 8 figs., 1934.

A brief, popular account is given of the most essential information at present available on walnut blight (*Bacterium juglandis*) and its control by spraying [see preceding abstract] in western Oregon. In 1933, the disease caused losses in the Pacific Northwest amounting to approximately 35 per cent. of the crop.

Varadaraja Iyengar (A. V.). **Contributions to the study of spike-disease of Sandal (Santalum album, Linn.). Part XVI. Distribution of arsenic in Sandal-wood treated with sodium arsenite.**—*J. Indian Inst. Sci.*, xviiA, 12, pp. 131–139, 1935.

In spiked sandal (*Santalum album*) plants [*R.A.M.*, xiv, p. 265] treated for eradication by girdling and applying to the exposed wood a solution of sodium arsenite [ibid., xii, p. 129] in the Bangalore district of India, large quantities of the poison were detected in the bark and sapwood, while movement of the substance was even noticed in the roots at some distance from the point of application. The root-suckers of treated plants may also be reached and killed out by the solution. Notwithstanding the presence of traces of arsenic in the heartwood of treated plants, no poison was detected in the oil thence derived by any method of extraction, so that this mode of eradication of the diseased trees does not interfere with the commercial utilization of the wood. Death of the sandal plants appears to be due to inhibition of nutrition due to killing by the arsenic of the tissues near the girdled parts.

Srinivasan (M.) & Srinivasaya (M.). **Contributions to the study of spike-disease of Sandal (Santalum album, Linn.). Part XVII. Hydrogen-ion concentration and buffering capacity as factors of disease resistance.**—*J. Indian Inst. Sci.*, xviiA, 14, pp. 153–164, 6 graphs, 1935.

The initial acidity and buffering capacities of spiked sandal (*Santalum album*) [see preceding abstract] tissue fluids were found to be higher than those of healthy ones. The gradient in reaction in decreasing order is

leaf, bark, wood, and root. Tissue fluids of sandal grown in combination with *Ruta graveolens*, *Murraya koenigii*, *Melia azedarach*, and *Toddalia aculeata*—hosts imparting relative immunity to the sandal trees parasitic on their roots—are more buffered than those from sandal trees which obtain their nutrition from haustoria on *Acacia farnesiana* or are deprived of any host, in both of which cases susceptibility to spike is extreme [cf. *R.A.M.*, xi, p. 82]. A significant correlation would thus appear to exist between disease resistance and the buffering capacities of the tissue fluids of sandal grown with different hosts.

DELEVOY (G.) & BOUDRU (M.). **Note sur le chancre du Peuplier.** [A note on Poplar canker.]—*Bull. Soc. for. Belg.*, xlii, 1, pp. 1–10, 1935.

After discussing at some length the recent papers by Day and Peace on poplar canker [*R.A.M.*, xiii, p. 408] and the part played by frost injury in the inception of the disease [ibid., xiii, p. 484], the authors state that one canker examined at Gembloux showed the presence of *Cylindrocarpon willkommii* [*Nectria ditissima*: ibid., vii, pp. 676, 677] and also a *Cytospora* and a *Valsa*. Inoculations with these three fungi gave rise to a canker from which they were all re-isolated.

Observations in Belgium confirmed the view that predisposition to canker varies with the type of poplar and the locality. Twenty-seven species and varieties of poplar were planted by the Belgian forestry experimental service in three localities with different soils, and the subsequent development of the disease showed quite clearly that the susceptible kinds of poplar were those with long turions and red or reddish petioles. The slowly growing types of poplar proved to have a greater predisposition to canker than those that grow rapidly. It appears that when selecting poplars for planting purposes preference should be given to the kinds that shed their leaves late and have green (not yellow) or only faintly coloured turions and petioles.

SCHEFFER-BOICHORST. **Pappelkrebs.** [Poplar canker.]—*Mitt. dtsch. dendrol. Ges.*, xli (*Jb.*), p. 181, 1934.

At the instance of the mycological department of the Forestry Institute, Hann.-Münden, the poplar stands of Velen, Westphalia, were visited in 1934 by Dr. J. Ehrlich of Harvard University, who found that the trees were attacked in epidemic form by *Nectria coccinea* var. *sanguinella* [*R.A.M.*, xiii, p. 479] and agrees with the German silvicultural authorities that the further cultivation of poplars in this district, pending the development of a canker-resistant variety, would be a grave error of judgement.

SERVAZZI (O.). **Contributi alla patologia dei Pioppi. I. La 'fillostictosi' del Pioppo nero e del Pioppo del Canadà.** [Contributions to the pathology of Poplars. I. 'Phyllostictosis' of Lombardy and Canadian Poplars.]—*Difesa Piante*, xi, 6, pp. 185–207, 4 figs., 1934.

Investigations [which are fully described] into the leaf spot of *Populus nigra* and *P. canadensis* caused in Italy by *Phyllosticta populina* Sacc. showed that in culture there were great variations [which are described] in the size and shape of the pycnidia and pycnospores, according to the medium used. Artificial inoculations of young wounded leaves gave

positive results, the infected area remaining limited, however, on adult wounded leaves. Infection was obtained more readily on *P. canadensis* than on *P. nigra*. No infection occurred on unwounded leaves or leaves kept in the dark. The maximum, minimum, and optimum temperatures for infection were, respectively, 30° to 33°, 8°, and about 18° to 20° C.

Normally, the disease does not cause serious damage, but in seasons unfavourable to the host great reduction of the leaf surface may result, especially when infection takes place in spring, while the leaves are still tender, in which case the vitality of one- to two-year-old seedlings in nurseries may be much impaired.

The aberrant forms observed in culture did not reappear on the host in inoculation tests, though the fungus showed a certain amount of variation even in natural conditions.

In view of these facts and the slight diagnostic differences between *P. populina*, *P. alcides* Sacc., *P. cinerea* Pass., and *P. prominens* Oud., the author considers that all these should be regarded as a single species, under the first name.

Brooks (F. T.) & Walker (M. M.). **Observations on Fusicladium saliciperdum.**—*New Phytol.*, xxxiv, 1, pp. 64–67, 1 fig., 1935.

Willows, especially *Salix fragilis* var. *decipiens*, in the Cambridge district have been liable of recent years to infection by *Fusicladium saliciperdum* [*Venturia chlorospora*: *R.A.M.*, xiii, p. 596] which causes blackening of the leaves and young twigs and almost complete defoliation before midsummer in a wet season. Cankers may be formed on the stems where the disease is arrested by dry conditions. The fungus overwinters in the dead twigs, on which sporulating pustules have been found just before the spring infection of the leaves. Inoculation experiments with *F. saliciperdum* spores on uninjured young plants of *S. fragilis* var. *decipiens* in May, 1934, gave positive results after an incubation period of eleven days, indicating the truly parasitic character of the fungus. This is in opposition to the observations of Nattrass and Dennis [ibid., xi, p. 214]. The blackening closely followed the line of the midrib towards the petiole which soon became involved, infection sometimes spreading also into the stem. The pustules of the fungus developed in profusion along the lines of the veins on the lower leaf surface. The rapid extension of the black discoloration may be due either to the secretion of some product by the invaded host cells or to a toxic element derived from the fungus.

The symptoms of the disease caused by *F. saliciperdum* are practically indistinguishable from those of *Physalospora miyabeana* [loc. cit.]. It would appear that the former is responsible for the infection of willows in the Cambridge area, while the latter is the usual, possibly the invariable, cause of the virtually identical disease in the Long Ashton, Bristol, district.

Boudru (M.). **La thérapeutique interne chez les végétaux. Perspectives d'utilisation pratique.** [Internal therapeutics in plants. Prospects of practical application.]—*Bull. Soc. for. Belg.*, xlii, 2, pp. 73–80, 1935.

After a general discussion of the various methods suggested by previous workers for treating plant diseases by internal therapeutics,

especially as applied to trees [*R.A.M.*, xiii, p. 641 *et passim*], the author emphasizes the necessity of using solutions with a favourable chemotherapeutic index [ibid., v, p. 619]. The method favoured by him is to cut branches of the plant affected, either herbaceous or woody, immersed in the solution; the best time to effect this treatment is spring and summer. In tests on the elder [*Sambucus nigra*] he determined the exact *dosis tolerata* for a number of solutions, and states that some of them behaved like water in regard to their diffusion through the cell walls. By a careful selection of the absorbing points a regular distribution of the curative substance may be attained throughout the whole plant. The paper terminates with a very brief discussion of the application of the solutions through the soil.

Bugnicourt (F.). **Contribution à l'étude du Sphaerostilbe repens B. et Br.** [A contribution to the study of *Sphaerostilbe repens* B. et Br.]—*Bull. écon. Indochine*, xxxvii, pp. 1321–1322, 1934.

Sphaerostilbe repens [*R.A.M.*, xii, pp. 21, 77, 207; xiii, p. 216] is stated to have been identified for the first time in Indo-China in July, 1934, on *Aleurites montana*, which it attacks in a virulent form, generally causing the death of the host shortly after the first appearance of the external symptoms of infection. No support is lent by the results of physico-chemical studies to the view that soil conditions are partially responsible for outbreaks of the disease, and the author considers that direct measures are absolutely essential to combat this formidable pest of tea and rubber plantations.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 2, pp. 37–40, 1935.

Spain. A Decree, dated 13th October, 1934, of the Presidency of the Council of Ministers, enforces the phytopathological inspection of Spanish oranges and other citrus fruits destined for foreign markets with a view to the exclusion from export of material infected by *Pleosphaeria* [*Limacinia*] *citri* [*R.A.M.*, iii, p. 211; vi, p. 92; x, p. 492] or other fungal and insect pests.

France. A Presidential Decree of 12th October, 1934, authorizes the Commissioner of the Republic in the territory of Cameroon to issue, with expert advice, orders enforcing the removal from plantations and destruction of diseased plants or plant parts and the application of disinfectants where necessary.

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Dutch Elm disease quarantine (domestic). Notice of Quarantine No. 71, with regulations.—*U.S. Dep. Agric. Off. Inform. Pr. Serv.*, 4 pp., 1935. [Mimeographed.]

The terms of Quarantine No. 71, effective as from 25th February, 1935, prohibit the inter-State movement from certain [specified] areas in New Jersey, New York, and Connecticut of any or all parts of elms of every species, with the exception of timber or products manufactured from or containing elm wood, in order to prevent the further spread of Dutch elm disease (*Ceratostomella ulmi*) [see above, p. 476].